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ABSTRACT

This proceedings contains 17 papers presented at the third annual faculty conference at the University of Victoria (British Columbia, Canada). Papers cover a wide variety of disciplines and topics, including student teaching, athletics, researcher-teacher collaboration, hands-on science instruction, violence prevention, youth violence, counseling, physical education, career development, Native American art and culture, culturally relevant science instruction, mathematics instruction, student evaluation, art education. and philosophy of knowledge. Following a conference summary by Ted Riecken, the papers are: "The Role of Oral Language in the Practicum Classroom" (Harold K. Derksen); "The Role of Mood States in Assessing Rugby Players: State or Trait Measure?" (Tanya Berry, Bruce Howe); "Researcher-Teacher Collaboration To Develop and Test a Constructivist Teaching Model" (Lily Dyson, Steven Toleikis); "Starting Small and with Uncertainties: Towards a Physically-Grounded Model of Learning from Laboratory Activities" (Wolff-Michael Roth); "Preventing School Violence by Building Connectedness: A Local Initiative" (Mary-Wynne Ashford); "Violence, Gender and Differential Socialization: Examining Male-Female Differences in the Youth Violence Project" (Ted Riecken, Sibylle Artz); "Caught in the Middle: A Counselling Program for Children of Divorce" (Geoffrey G. Hett); "Meeting the Needs of Female Physical Education Students in High School" (Sandra Gibbons, Catherine Gaul, Geraldine Van Gyn, Joan Wharf-Higgins); "Influence of Aerobic Fitness on High Intensity Anaerobic Performance in Females" (Catherine A. Gaul, David Docherty); "Implementation of the K-7 Personal Planning Program" (Anne Marshall); "Yet Sun Heywa: Developing a First Nations Art Website" (Bill Zuk, Robert Dalton); "Rediscovering Traditional Science in Multicultural Science Education" (Gloria Snively, John Corsiglia); "Attempting To Foster the Development of Number Sense" (Werner W. Liedtke); "Investigating the Evaluation of Student Achievement" (John O. Anderson); "The Art Glass Movement and Curriculum Design for Higher Education" (Laura Kaufman-Weisbord); "The Acquisition of Strength: Catalyst for Research" (David Docherty, Catherine A. Gaul); and "Between Suicide and

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Murder--Living in the Space?" (Antoinette Oberg, Denyse Parizeau, Sue Taylor). (Contains references in most papers.) (SV)

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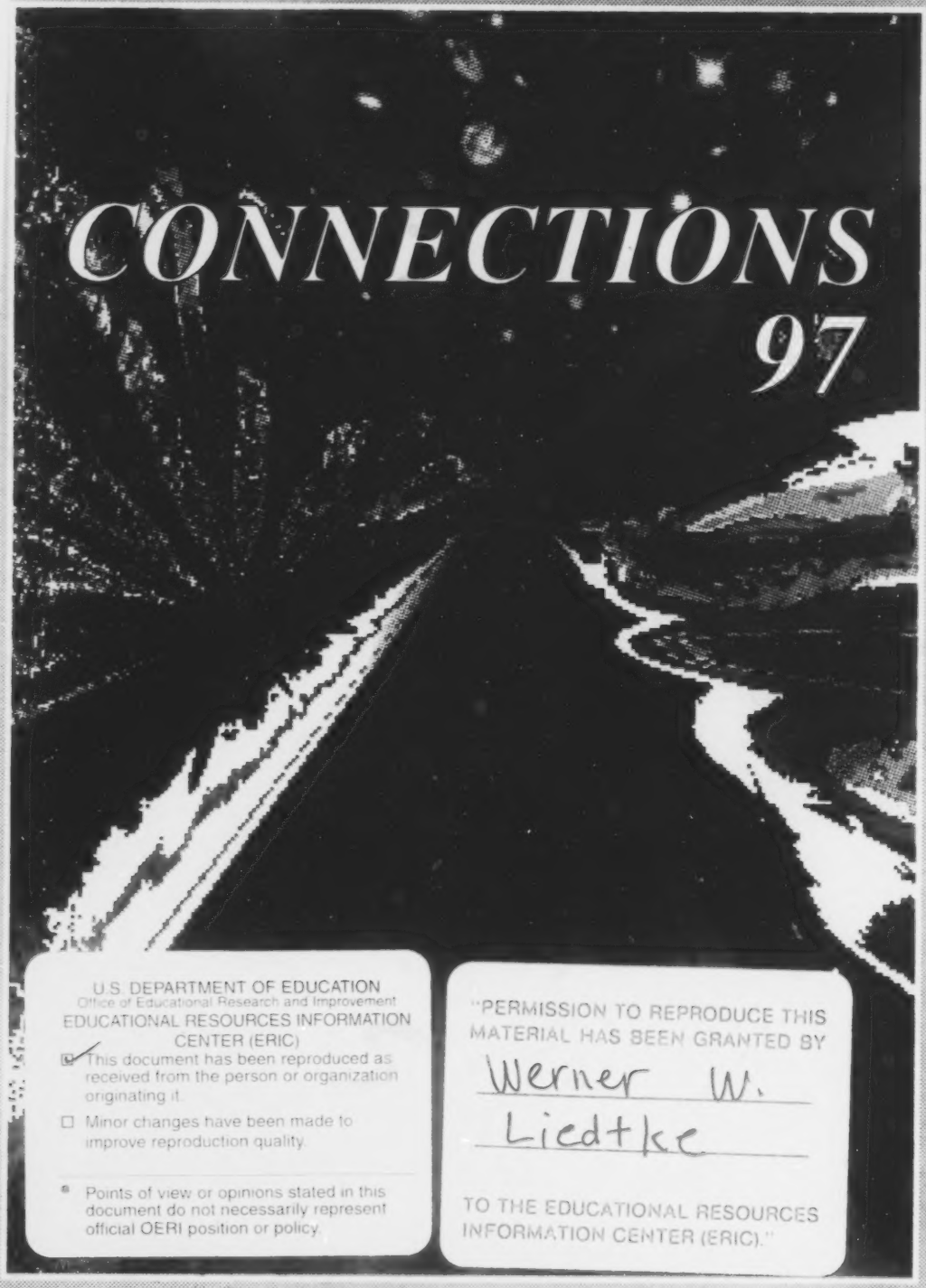

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Connections '97

Edited by
Werner W. Liedtke

University of Victoria

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Thank you very much.

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Welcome to Connections '97

This publication has as its origin the May 1997 Faculty of Education *Connections* Conference held at Dunsmuir Lodge. As was the case for the previous conferences, the main goal for the two days was to give as many presenters as possible a few minutes to share some comments about present areas of interest, concern or contemplation. This somewhat unusual format gives the audience exposure to a wide range of ideas. This publication provides those who delivered brief papers with the opportunity to elaborate, within specific guidelines, on these presentations.

The content and spirit of Connections '97 was captured admirably by Ted Riecken, the Director of Graduate Studies and Research in the Faculty of Education, in his summary of the conference. An abstract of this summary is included here. This review, which provides some information about the diversity of the Faculty of Education, appears at the beginning for two main reasons. It allows the reader to experience the nature of the conference as a whole and then decisions about further reading can be made with regard to ideas that may arouse curiosity.

Not all of the conference presentations are included in this publication. However, the papers that appear offer a valuable reminder, or snapshot as it were, of what the Faculty of Education was about at a given period of time. They are not only a partial record of the third annual conference, but also a permanent reminder of our very diverse nature—which to many outside the Faculty may come as somewhat of a surprise. A scan of the *Table of Contents* reveals this wide range of interests.

All groups within the Faculty (departments/school) were represented at the conference. In addition to regular faculty members, there were other individuals who made presentations. Their presence further illustrates the nature and diversity of the conference.

Joanne Omara is from the Faculty of Education, Griffiths University in Australia.

Laura Kaufman-Weisbord and *Harold K. Derksen* are from the Faculty of Education, Okanagan University College in Kelowna, B.C.

Sibylle Artz who presented with Ted Riecken is from the School of Child and Youth Care at the University of Victoria.

John Corsiglia who presented with Gloria Snively is from Wilp wilxo' oskwhl Nisga'a University College in New Aiyansh, British Columbia.

Steven Toleikis who presented with Lily Dyson is a teacher from the Greater Victoria School District.

Bruce Howe presented on behalf of *Tanya Berry*, a graduate student, and himself.

Denyse Parizeau and *Sue Taylor* who were part of the presentation with Antoinette Oberg were graduate students at the time.

Wolff-Michael Roth is the Lansdowne Chair of Applied Cognitive Science and Science Education.

To a certain extent the content of this publication can make others aware of what we are about. For us, it can provide an opportunity for further communication, for reflection, or for both. The recorded ideas may lead readers to further pursue these ideas, or they may even lead to new ideas. These possible outcomes made putting this publication together a worthwhile task.

Werner W. Liedtke
August, 1997

Connections '97: The Presentations

Ted Riecken

The summary is an attempt to provide a framework for the numerous possibilities for establishing connections that exist. In addition, possible challenges and difficulties related to connecting are pointed out.

Within the larger culture of the university, faculties of education occupy a challenging position. Charged with the dual responsibilities of teacher education and research, they sit at the juncture of theory and practice. As examples of what Lave & Wenger (1991) refer to as communities of practice, and faculties of education reside on the periphery of the field based culture of the teaching profession as they prepare students for entry into the profession. Within the university, faculties of education occupy a similar peripheral space in which they render pedagogical interpretations of the parent disciplines from which school subject matter and practice are drawn. As a form of practitioner community, faculties of education are arguably marginalized by these peripheral positionings. Teachers in the field often look askance at the "ivory tower" tinkerings that they see emanating from the university, and as a professional body, teachers may express doubt about the role of the university in determining the substance and strategies most appropriate for the development of competent teachers. Similar uncertainties are, at times, reflected in the doubtful whisperings by some of our undergraduate clients, who as student teachers speculate about whether their professors could *really* teach in the classrooms for which they are being prepared. Similarly, across North America, as relative newcomers to the university, faculties of education struggle for recognition of not only their research efforts, but for acknowledgment of the legitimacy of the subject matter of their teaching, as they work with what are often seen as derivative and distilled versions of the more established disciplines of the humanities and the social and natural sciences (Ginsberg & Clift, 1990).

Positioned as such, the challenge for faculties of education has been to establish the kind of connections that allow them to move from positions of marginality to ones that situate them solidly within their partner communities of profession and university. Establishing such connections is not an easy task. In essence, it requires a bifurcation of effort that speaks simultaneously to both the practice based interests of the field and the theoretic world of the university. Combined with this challenge is the related task of establishing

organizational connections among highly disparate orientations to education typically found in faculties of education.

The presentations at the conference are representative of such connections. Originating as contributions to the Faculty of Education's third annual research conference, they represent a broad range of interests and activities that speak to both the field and the university through conceptual, empirical and hermeneutic approaches to inquiry. The nature of teaching and learning experiences from the perspective of the learner was examined several times. *Miller* described using a case study to help pre-service drama education students understand the relation between theory and practice; *Mather* and *Hanley* examined the experiences of the members of the Year Two cohort group in the Faculty of Education; *Derkson* reflected on the nature of orality in teaching; and *Robertson* and *Marshall* investigated the development of their students' notions of professional autonomy. Each of these accounts reflects a concern with the connections that exist between teacher and student, and the connection that resides in the reciprocal nature of learning as it is found in the roles of teacher and student.

Other presentations examined teaching and learning processes and the role that an individual's cognitive stance plays in learning. *Berry* and *Howe* worked on mood states in athletes; *Dyson* and *Toleikis* studied constructivist teaching strategies; and *Roth* investigated situated cognition. These investigations are representative of inquiry connecting to the extant disciplines of psychology and cognitive science.

A number of the papers were framed around the roles that schools can play as agencies for the social construction of self and other. *Ashford*'s work on violence, boredom, and meaninglessness; studies by *Riecken* and *Artz* on youth violence; *Stanley*'s insights on the perspective of the other; and *Hett*'s investigations on children of divorce all addressed a notion of connection concerned with the development of what is arguably the fourth (and most neglected) "R" of the basics of education, that of relationships.

Related to the theme of schools as social agencies is a perspective that examines the broad connections that schools have to the larger society, especially in terms of political economies and the emergent concerns of gender and identity politics. These concerns were represented by *Harris*' paper on the political and gendered implications of the devolution of decision making in educational institutions; and *Depledge*'s exploration of the political dimensions of curriculum development, as manifest in the new Technical and Communica-

tions 12 curriculum. *Gibbons*, *Gaul*, *Van Gyn*, and *Wharf-Higgins* reported on the need for more gender specific curricula in the area of physical education; *Gaul* and *Docherty* investigated the influence of aerobic fitness of high intensity anaerobic performance in females; and *Marshall* contributed an examination of an support package and program designed to help teachers implement a new, provincially mandated curriculum.

Three of the presentations at the conference dealt with connections in an electronic universe, focusing on the role of technology as a vehicle for connecting learners to each other, and to the vast information resources available through the World Wide Web. *Zuk* and *Dalton* reported on exploring the use of the internet as a vehicle for teaching and learning about aboriginal art; *Numweiler* and *Muir* described the applications that multimedia authoring systems hold for children's learning; and *Potter* outlined the development of a modularized curriculum for teaching young children the core elements of technological literacy.

Just as emerging technologies are forcing a reconceptualizing of the manner in which curricular visions are delivered, a number of the presenters suggested advancing new frameworks for the conceptual underpinnings of their own areas of expertise. *Snively* and *Corsiglia*'s insight about the overlap between western and indigenous notions of science and technology points to the need for a critical assessment of the manner in which knowledge is recorded and eventually reified within the confines of a given discipline. *Liedtke* commented on children's developing notions of number sense and how teachers can foster this development in their students. *Anderson*'s report on the evaluative practices of classroom teachers cast curriculum in a new light as he illustrated the large degree of unexplained variance in student achievement inherent in particular evaluation procedures. *Kaufman-Weisbord* provided a rationale and framework for an art-glass curriculum. *Docherty* and *Gaul* identified issues related to the development of muscular strength and described the work that is being done by faculty and graduate students. *Omara* advocated the use of drama education in examining the role of a teacher as a learner and a teacher.

And finally, at a philosophical level, two of the presentations examined the very foundations of curriculum itself. In examining language as a tool for the expression of understanding, *Johnson* pointed out the arbitrariness of language systems, stressing both their generative and fluid capacities, along with an examination of the implications that those features hold for language learning. *Oberg*, *Parizeau* and *Taylor* went even deeper and examined the possible

implications that knowing holds for the spirit of inquiry itself. Focussing on the tensions that lie between certainty and the quest for knowledge, they asked us to consider the moral and ethical dilemmas that can accompany the application of knowledge.

Each of the papers addressed in some manner or other, a notion of connection. Some connected to the field and linked theory and practice; some concerned themselves with connections between individuals; and some connected across disciplines and represented an interdisciplinary approach to inquiry. Each of them, by virtue of their connection to the broad tableaux that is educational research, enhanced the larger whole of which they are a part.

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The Role of Oral Language in the Practicum Classroom

Harold K. Derksen

Student teacher perceptions of factors affecting oral interactions within their practicum classroom were investigated. The definition and value of orality in the classroom are followed by an analysis of the results of a study which examined interview transcripts, journals, questionnaires and post-analysis interviews.

Purpose

School should be the place where we hear the full sound of the conversation of humankind (Booth, 1994, p. 248).

This study identifies and describes factors which student teachers perceive as affecting the development of an orally interactive environment within their practicum classroom. Through the analysis of student teacher interviews, dialogue journals, questionnaires and post-analysis interviews sufficient data will be generated to allow for the identification and description of such factors. The intent of this identification and description is to promote *orality* as a valid medium for constructing knowledge within the classroom and subsequently to increase its validity in teacher education (Berk, 1994). The identification and description of factors affecting pupil oral interactions in the classroom will provide for sufficient strategic knowledge to permit the design of student teacher programs which utilize the potential of dialogue for intellectual growth (Lazar, 1995; Shor, 1987).

Rationale

If the student teacher practicum is a significant component of teacher development and if interactive teaching approaches are effective for classroom negotiation and meaning-making, then data generated from student teachers should provide sufficient evidence of the praxis (theory and practice) of *orality*. Using an inductive-constructive approach it should be possible to generate-verify constructs which emerge from student teacher data. If the factors which

affect the facilitation of an orally interactive learning environment are identified and described, they can then become the catalyst for promoting more orally interactive strategy use within teacher education programs and subsequently within regular classrooms.

Orality: Definitions and Significance

Orality was utilized by Olson (1987) to equate the effectiveness of reading and writing with speaking and listening for the purposes of knowledge construction. For the purposes of this study *orality* refers to the use of speech for purposes of meaning making and knowledge construction. Orality and literacy are autonomous, yet complementary media with *orality* particularly exemplary as a socio-linguistic means of knowledge construction (Bugarski, 1993; Vygotsky, 1962). Orality as a knowledge construction medium functions in multiple ways, including the construction of self within a social group.

As a medium of negotiation and meaning-making, *orality* is widely acknowledged to be the most fundamental, yet often overshadowed, language art (Teale, 1996). The fact that oral language has and continues to occupy a fundamental position as a medium of communication has given increased impetus to the need and utility of such a term (Buckley, 1992: Lakoff, 1982; Olson, 1994; Ong, 1992). Oracy, a term intended to represent oral language facility equivalent yet parallel to literacy, was coined by Wilkinson in 1965. It has subsequently been superseded by the use of *orality* (pre 1982 *orality*/oracy ratio of titles-word use was 25/37; since 1983 that ratio is 140/40; ERIC 1966-82 & 1983-96).

Orally interactive classroom settings are those in which pupil talk is valued and fostered for negotiation and meaning-making. Talk in these types of settings is often initiated by pupils and is directed at achieving some personal or group learning goals. Teachers who employ orally interactive teaching strategies are often characterized by their 'coaching' attributes. Teacher talk in such interactive classrooms are characterized by being encouraging, facilitating, and resourceful rather than presentational or authoritative.

Orality is crucial in the classroom as all children, with few exceptions, speak a language when they come to school. The fact that children manage to acquire any one of more than 15 000 languages spoken around the world with ease and at a very young age should persuade us of the latent productivity of the universality of oral language (Buckley, 1992). Historically and individually oral language develops first and the long history of any human culture is in many ways defined by its oral language.

Orality in the classroom is crucial in that it is the one means by which most all children have access to knowledge construction and meaning making. By utilizing *orality* for knowledge discovery, pupils are given a 'voice' which for young children is their most effective language medium (Barnes, 1976; Halliday, 1973; Wells, 1986). Without oral interaction the discovery and accommodation of new ideas becomes artificial and transitory (Barnes, 1993; Booth, 1994; Vygotsky, 1962). Without pupil dialogue, teachers rather than learners shape and reshape ideas, construct patterns, and offer alternative explanations. Conversational involvement engages pupils in a kind of interactive talk which promotes inquiry and exploration. With access to dialogue pupils are enabled to express personal views, challenge those of others and most significantly, define to themselves what they think and understand.

Orally interactive classrooms can provide pupils with time to verbalize ideas to 'see' what they 'sound' like. Sociolinguistic theory suggests that conversations which provide participants with 'rehearsal' time, provide a time to perfect or reshape the phrasing of an idea (Pinnel & Jaggar, 1991). Simultaneously, knowledge construction in social environments can allow for time to accommodate new ideas into inner thought (Berk, 1994; Cook-Gumperez & Gumperez, 1992; Nystrand et al., 1993; Yaden, 1984).

Orality in school can be effective because of its relationship to inner thought as it can provide teachers with a view or 'window' as it were, of student learning and understanding (Wells & Chang-Wells, 1992). The comment by Socrates that 'thinking is the mind talking to itself' suggests that oral language is not only a useful metaphor describing external mental activity but also a metaphor describing mental activity (Postman, 1995). In other words, talk can dramatize learning through dialogue and thus provide teachers with an immediate and authentic view of student learning (Strachan, 1990).

Orality is crucial in that its recognition in the classroom underscores the fundamentally oral nature of humanity for it is through speech that human beings are truly human. Although many surrogate languages such as ideographs, phonetic writing, printing, telegraphy, photography, radio, movies, television, and computers have each transformed the world in their own way, in one way or another they have all distanced the visual symbols from their origin as sounds and from the source of their meaning (Postman, 1995). Speech reaffirms the essentially empathetic and participatory nature of human communication. Dialogue engages the emotions and encourages the interaction of speaker and listener. Spoken language engages through immediacy, participation, and emotionally charged experiences.

Through classroom conversations, teaching and learning processes are not

isolated from each other but become interactive, vital, and reliable as a means of linking teaching and learning (Hiebert, 1990; Cook-Gumperez & Gumperez, 1992). Although language is fundamentally an oral medium, reading, writing, listening, and speaking are interactive processes requiring balanced and equitable treatment in the classroom. The schools' tendency to 'chauvinism' about reading and writing does not allow pupils access to the persuasiveness of oral language which eases and simplifies the abstractions of reading and writing (Buckley, 1992). Reading and writing are derivative processes of oral language which emanate from the verbal foundation of thinking in and through oral language. Orality contributes significantly to knowledge construction in all discourses and the identification and description of factors which affect oral language development becomes a necessary first step in promoting the praxis of *orality*.

Subjects and Data Collection

The data for this qualitative study was collected from a group of 24 student teachers (20 female; 4 male) in their final year of a two year Teacher Education Program provided by a Western Canadian University. The student teachers ranged in ages from 22 to 35. They were placed in three public and one private elementary school classroom that included Kindergarten to grade seven.

The primary source of data for this study were interviews of 40 to 50 minute duration. These interviews which were audio-taped, transcribed, and analyzed to identify factors that the student teacher perceived affected the development of orally interactive classrooms (see Table 1). Focus questions were constructed to provide student teachers with a variety of entry points into the 'conversation' concerning oral interactions in the classroom.

Table 1 Subject Data Collection Characteristics (N=24)

	Interviews	Dialogue Journals	Questionnaires	Post-Interviews
Term 1 Students	6	6	18	-
Term 2 Students	7	7	6	-
1 year later Students	-	-	-	2

There were 13 interviews, six students (female) after the initial practicum and seven students (three male; four female) after the final practicum, three students for the second time.

The dialogue journals collected are unique in that the data represented by them records the perceptions of student teachers *during* their practica. There were no guidelines for these journals other than reflection of their practicum experiences which were to be made available for reading and responding to by their sponsor or supervisor. Their perspectives of oral interactions were, among other things, either not yet formed, or being formed or being altered because of their classroom experience. Dialogue journals of student teachers (three male; 10 female) were read by the researcher to identify comments made which might reflect student teacher concerns regarding the establishment of orally interactive classrooms (See Table 1). It was expected that comments made in these journals would provide additional evidence to support, refute, or modify perspectives revealed in the interviews.

An anonymous questionnaire was administered twice in the calendar year, once after each practicum. The 10 questionnaire statements were constructed to allow for responses on a Likert-type continuum. This questionnaire was expected to yield information on post-practicum student teacher perspectives regarding the value, concerns, and effectiveness of orally interactive classrooms. Responses to these questionnaires are expected to support, challenge, or modify findings generated from the analysis of the post-practicum interviews and dialogue journals.

A major consideration in all research is validity and through triangulation with the dialogue journal comments and questionnaire responses, the significance of the interview findings was enhanced. However, an even more effective strategy suggested by Ely, et al. (1992) is a 'return to the field' whereby the researcher can re-check the findings discovered with the study participants. As part of this validation strategy two students participated in these post-analysis interviews.

Student teacher responses to focus questions in the interviews regarding factors affecting oral interactions within their classrooms were highlighted and separated into similar content groups. With repeated and recursive clustering relatively homogenous groupings emerged. Subsequently these groupings revealed common core issues under which comments could be clustered. The resulting clusters of 24 factors accommodated all the various student responses and are summarized in Table 2.

Table 2 Categories and Factors

Categories	Factors	Descriptors
Knowledge	1. declarative	• having been made aware of or having oral work demonstrated or modeled or experienced
	2. procedural	• selecting, monitoring, evaluating, products and processes of interactive learning
	3. conditional	• aware of the effectiveness of orally interactive strategies
Position/Role	4. needing confidence 5. concerns of risk-control 6. amount of experience 7. personal ego power 8. being observed 9. sponsor expectations	• factors student teachers reveal as influencing their performance in the classroom related to their role as teacher apprentices
School Community Expectations	10. justification 11. parent/principal/pupil expectations 12. tradition	• much of what a student does is motivated by a desire to please forces outside of self. • societal expectations as portrayed in the media, expressed by parents, their experience as students, and influences of society
Structural Factors	13. physical 14. organizational 15. temporal	• constraints on oral interactivity include timetables, room layout, and time.
Assumptions	16. writing is concrete 17. writing is easier to evaluate 18. speaking difficult to evaluate 19. speaking takes more time 20. speech not recoverable 21. speech subjective 22. recording unnatural 23. age differentials 24. teacher on 'stage'	• largely indicative of perspectives held about the nature of literacy compared to the nature of *orality* plus differences in age expectations and the teacher being 'in charge.'

Through recursive manipulation of the 24 factors into larger groupings some common characteristics emerged. These common characteristics were labeled as categories of: student teacher knowledge; student teacher role or position; school community expectations of the student teacher; structural factors affecting oral interactivity; and student teacher assumptions about *orality* in the classroom.

A frequency distribution of the interview comments addressing the categories in Table 2 is shown in Figure 1. The indicated percentages reflect the number of interview comments for each factor compared to the total number of comments made for all factors.

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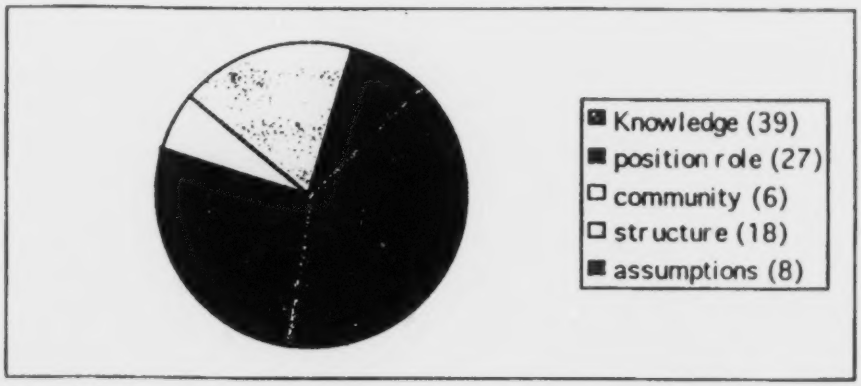
Figure 1 Percentage of Interview Responses per Category



Conclusions

To enhance oral interactions in the classroom each of the factors delineated under categories of knowledge, position/role, school community expectations, structural and assumptions need to be systematically addressed. Some of these may be addressed in methods courses, some in foundation courses, yet others most profitably during the practicum.

Through the diversity of spoken and written dialogue pupils gain access to learning, are able to display learning, and can extend their learning. Teacher education programs must train teachers to be responsive to the plurality of ways that children create texts (Bianchi & Cullere, 1996). Prospective teachers require an awareness of the multiplicity of avenues to the discourse community. Organizational alternatives can be developed, experienced, and modified to allow for the development of orally interactive classrooms. Through demonstrations teacher education students can experience and learn to modify classroom procedures to encourage, enhance, and validate opportunities for oral interactions.

It is and was not the intention to suggest that literacy be replaced with *orality*, but rather to represent more equitably the whole range of 'ways with words' that pupils bring to school (Buckley, 1992; Bianchi & Cullere, 1996). Orality in the classroom must not be left to chance. It was the purpose of this study to identify and describe factors that affect the praxis of *orality* and thereby balance the 'multiple ways with words' in the classroom.

Implications

One of the most important implications evident from this study was the need for more procedural experience in organizing, managing and monitoring pu-

pils grouped for oral interaction. It seems surprising that after a two year program these students were still amazed that pupils could learn within groups, at the need for teaching interpersonal communication skills, and that groups needed to be monitored through encouragement, suggestion, and modification. Student teachers made these comments in all grade levels.

Student teacher criticism of the theoretical focus of much of their education program is validated by the large percentage of procedural comments made in this study (See Figure 1). With the focus of education programs on pupil learning many students have not been made aware of, developed, or practiced procedural routines for management and discipline (Kagan, 1992; McDermott, et al., 1995). Much more could be done to educate student teachers to value oral interactivity and how to implement strategies to result in positive and constructive management procedures before they enter the practicum classroom.

It is incumbent upon teacher education programs to develop programs that address the factors identified and described in this study by providing experiential knowledge to support more oral interaction. Orally interactive strategies require theoretical validation for knowledge construction in teacher education before practical development in the school.

Some criticism has been directed at the practicum portion of pre-service programs because of its lack of a specific curriculum (Zeichner, 1990). A practicum curriculum focusing on procedural factors affecting oral interactivity in the classroom has much potential. It would be a productive focus for both student teachers and their various supervisors.

It is imperative that student teachers experience methodology courses where faculty 'teach as they preach' (Craig, et al., 1994; Lambdin & Preston, 1995; Watson, 1995). This can be done through faculty modeling as well as through student teacher practice. In this study students indicated they hadn't seen or heard of a teaching strategy that departed much from students listening and writing while the instructors spoke.

The belief systems or 'latent culture' of student teachers requires addressing in preparatory education courses to expose and question the dominant modes of pedagogy which exist. Simultaneously, prospective teachers need to be provided with experiential knowledge of alternative pedagogical strategies that promote oral interactivity (Tabachnick & Zeichner, 1984).

In lesson planning, special mention should be made of 'talk' strategies similar to reading or writing strategies to elicit the full range of language functions. Many types of talk should be demonstrated, experienced and appropri-

ate assessment strategies developed (Barnes, 1993). The use of audio/video technology should be demonstrated and experienced as meaningful and practical for knowledge construction.

Specific assumptions about spoken versus written modes of communication held by student teachers need to be addressed through discussion but more importantly through practical experiences of recording, evaluating and monitoring pupil speech events. Modeling by faculty of individual, small or large group teaching can provide student teachers with 'cognitively dissonant' experiences to potentially modify prevailing assumptions.

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The Role of Mood States in Assessing Rugby Players: State or Trait Measure?

Tanya Berry and Bruce Howe

The Profile of Mood States (POMS) has been used in sport psychology to claim athletes possess a stable positive mood state described as an "iceberg" profile. The validity of this claim is examined for a group of rugby players over a four week period.

Personality assessment has been a long standing interest in sport psychology both from a research and applied perspective. This interest had been demonstrated by the frequent use of general psychological inventories to describe differences between different populations. Subsequently, specific sport instruments were developed for this type of research (Cox, 1994, p.32). The strong belief that an ideal personality exists for successful athletes was popular in the 1960s. This belief was questioned in much of the literature but it has regained popularity largely because of the use of the Profile of Mood States (POMS) developed by McNair, Lorr, & Droppleman (1971).

The use of the POMS within a sporting context was first advocated by Morgan (1978). He postulated the existence of a desirable mood profile shown by the six POMS subscales. Data from his research showed that the five negative subscales were typically lower than and the one positive subscale was higher than the "water line" of the general population norms. Critical to an acceptance of his theoretical position is the assumption that the subscales of the POMS represent stable personality factors of athletes. This belief seems to be in conflict with the original purpose of the test developed to assess a "transient, fluctuating affective state" (McNair, Lorr, & Droppleman, 1971, p.5) in patients undergoing treatment for mental depression.

A number of studies have yielded data that support Morgan's initial results. Researchers have examined a number of different populations and reported the existence of the *iceberg* profile for athletes in the sports of distance running (Morgan, 1978; Morgan, O'Connor, Ellickson & Bradley, 1988); rowing and wrestling (Morgan, 1980); wheelchair basketball (Hanschen, Horvat & Rosewal, 1992); and cycling (Hagberg, Hullin, Bahrke & Limburg, (1979). However, results from these studies cannot be appropriately used to conclude

permanence of the trait nature of the POMS because the participating athletes completed the POMS in one testing session.

Further, results from other studies have failed to support the *iceberg* profile but rather have shown mood changes within a population. Daiss, LeUnes, & Nation (1986) found no significant differences between successful and unsuccessful collegiate football players. When ultramarathoners were given the POMS before and after a 100 mile race, they showed the *iceberg* profile before, but not after the race (Tharion, Strowman & Rauch, 1988). Other studies have shown that prior to workouts, athletes tend to show a more positive mood state, but that after heavy training, or when overtrained, athletes show a flat profile (Raglin, Morgan, & Luchsinger, 1990; Morgan, Costill, Flynn, Raglin & O'Connor, 1988).

The state nature of the POMS test has been supported by the results of studies outside competitive athletics. In a study of office workers, it was found that there were significant differences in mood profile from morning to evening of the same day, even though the subjects were asked to indicate to rate their mood over the same time set of "how have you been feeling during the past week including today" (Hill & Hill, 1991). Further, when non competitive runners took the POMS test at different times before and after exercise, significantly different mood states were reported, with the best profile being just before and about three hours after exercise (Dyer & Couch, 1987).

The existing discrepancies in the research and the explicitly stated purpose of the POMS, led to the decision to design a study to determine whether a group of athletes will show consistent POMS profiles across several testing situations. A second purpose was to determine whether the iceberg profile as postulated by Morgan (1978) would appear. It was hypothesized that: there would be variation across the variables from week to week, and there would be no iceberg profile.

Method

The subjects were male rugby players from the varsity and junior varsity programs at the University of Victoria. Although up to 39 athletes responded to the POMS at different sessions, 26 responded to all sessions and their data were retained for major analysis.

The POMS is a 65 item adjective checklist rated by the subject on a five point Likert scale. There are six independent factors identified: tension-anxiety, depression-dejection, anger-hostility, vigor, fatigue, and confusion.

Data were collected from the subjects at the beginning of their Monday practice for four consecutive weeks during regular league play. As a framework for their responses, the subjects were asked to complete the POMS by describing their feelings from "Friday's practice through their weekend game."

To determine the consistency of the responses across testing, all data were analyzed by the SPSS 6.13 repeated measures ANOVA. Where further analysis was justified, a paired samples test was employed. To determine the possible presence of the iceberg profile, means and standard deviations for each subscale were calculated at each testing session and were converted to T scores in order to make the comparison to the norm measures.

Results

A series of repeated measures ANOVA on each of the variable showed that there were no significant differences found between the testing situations on any of the POMS subscales with the exception of anger ($F=2.24$; $p<.05$). Further paired t-tests showed that anger, when measured in the fourth week, was significantly different from the first week [$t(21)=2.24$; $p<.05$], second week [$t(21)=2.45$; $p<.05$], and third week [$t(21)= 2.65$; $p<.05$]. The means for the subscales for all testing sessions are shown in Table 1. When the means were converted to T-scores and compared to norm measures (McNair, Lorr & Droppleman, 1971), the *iceberg* profiles identified by Morgan (1978) were not present (see Figure 1).

Discussion

The results indicated a relatively stable profile for most of the weeks with the exception of the T-scores for the anger scale which were significantly lower in the fourth week. However, on viewing Figure 1, it can be concluded that there existed a general suppression of the negative emotions at the fourth testing period. This could be due to the fact that the game was the final league fixture of the year and this may have led to a reduced emotional involvement following the event. It is also likely that the delay in filling out the form could have had a flattening effect on the the mood profiles generally. This would be consistent with the findings of Hill & Hill (1991) who obtained changes in mood profiles in the same day, despite asking the subjects to consider the same week long response frame.

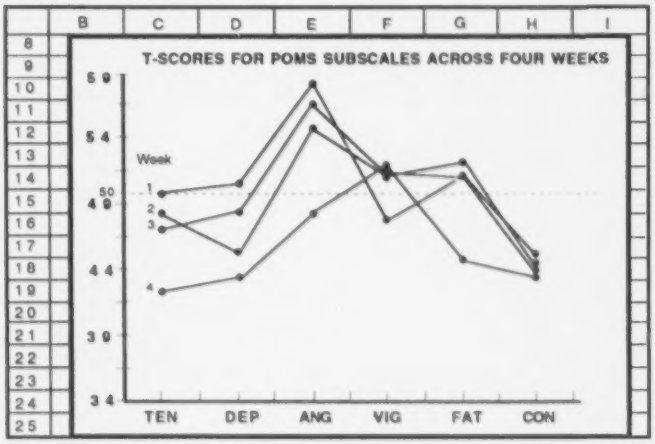
The *iceberg* profile did not appear at any of the testing situations. Indeed for three of the four weeks, the highest value obtained was for anger. It may be that this emotion is more likely to be found in a contact sport. Research has

shown, for example, that anger is high in karate athletes (McGowan & Miller, 1989; McGowan, Miller & Henschen, 1990). As far as rugby is concerned, aggressive behaviour is likely to be a factor. Terry (1995) argued that the nature and length of time that the sport continues could affect mood states and this might be a factor in a sport such as rugby which involves continued contact for 90 minutes.

Table 1 **Means and Standard Deviations for POMS Subscales at Four Testing Sessions (N = 26)**

Subscales	Week	Mean	S.D.
Anger	1	13.46	9.79
	2	14.62	6.79
	3	16.15	12.19
	4	8.73	8.40
Tension	1	12.35	6.97
	2	11.08	5.77
	3	13.23	8.64
	4	8.27	5.55
Fatigue	1	12.42	7.24
	2	11.12	7.51
	3	11.23	7.15
	4	7.62	4.97
Vigor	1	16.19	5.16
	2	16.62	5.63
	3	14.19	5.78
	4	17.38	6.84
Confusion	1	8.12	4.31
	2	8.38	5.73
	3	8.69	5.45
	4	7.15	4.29
Depression	1	9.35	9.56
	2	12.31	10.04
	3	14.50	12.57
	4	6.73	7.63

Figure 1 **T-Scores for POMS Subscales**



The results of this study showed no evidence of iceberg profiles and little support for consistency as indicated by the wide fluctuations in the anger scale. Further, the study results suggest that the POMS test is not useful in determining traits but rather, could be helpful in detecting changes in emotional states at different times in a competitive season and in determining readiness of athletes for competition. The observation of changing values in responses could signal a need for intervention and could provide coaches with information to prevent poor performances or even burnout. Perhaps such a usage of the test better mirrors the purposes for the original test.

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Researcher-Teacher Collaboration to Develop and Test a Constructivist Teaching Model

Lily Dyson and Steven Toleikis

The process of collaboration between a researcher from the university and an elementary school teacher that involved the development and assessment of a model of constructivist teaching is described. Children's learning products are exemplified at each stage of learning. Reflections indicated professional growth.

An increasing emphasis in education is on collaboration between researchers and teachers (Barnett, 1990; Goodlad, 1988). This emphasis is partly prompted by "the movement away from research conducted **on** schools by outside researchers with their own agenda to research conducted by and with researchers and practitioners on a common agenda" (Sirotnik, 1988, p. 174). This direction and interest may especially be motivated by the growing recognition that knowledge production is a responsibility shared by practitioners and the research community (Bickel & Hattrup, 1995). Typically, the researchers offer the skills and expertise to conduct research and develop programs to support teaching and learning. At the same time, teachers have the practical experiences with classrooms and are best able to put theories into practice and to evaluate the outcomes. However, how researchers and teachers may collaborate to create knowledge and to advance both theory and practice remains to be investigated.

Of specific interest would be the issues related to the types of collaborative processes researchers and teachers experience together to create knowledge, the possible outcomes, and the possible growth that may be experienced by the researchers and the teachers as a result of this collaboration. According to Barnett (1990), studying the collaborative processes may yield insights into the factors that impede or promote collaboration. Sirotnik (1988) identified an essential characteristic for collaborative research to be mutual growth among the participants. Moreover, investigating the impact of programs derived from collaboration on the research participants is a legitimate line of research (Barnett, 1990).

Educational reform also demands reform of teaching methods. An educa-

tional method attracting much interest is constructivist teaching (Fosnot, 1994). This method, however, awaits further delineation and testing. Is it possible, for example, for a constructivist teaching model to be developed collaboratively between researchers and teachers? One such promising model of collaboration is the "research colleague" model (McDaniel, 1988-89). As part of this model, research is done by and with, rather than "on" teachers. This study investigated the processes in which a university researcher and a school teacher collaborated to design and carry out a teaching program based on a constructivist approach. The study also investigated the effect on student learning.

Initiating Collaboration

Initially, a study was designed to promote social integration of children with disabilities by teaching children about the concept of disabilities. A predetermined teaching program and a model were prepared to be tested with the help of the teachers. The model utilized a traditional teaching approach whereby a set structure of information was to be provided to the learners. It was planned that the teachers who collaborated were to act merely as a facilitator in the delivery of the program.

During the first interview, the teacher who is the co-author of this paper, proposed an alternative method to teach children about the meaning of disabilities. Arising out of a successful teaching practice, it was proposed that rather than imposing a top down method of teaching these difficult concepts, a different method should be tried. It was proposed that the children would themselves investigate the concepts of disability and would then prepare learning materials to teach these concepts to other children. The assumption was made that perhaps children can best learn the ideas related to disabilities by teaching other children about them. The very process of preparing to instruct others would itself become a powerful learning experience for the students, and they would themselves become experts in understanding disabilities.

Selecting a Teaching Model

Following the initial conversation, attempts to become familiar with the teacher's view and method of teaching involved observations and reflections by the researcher. During these observations, it was found that the prevalent methods of instruction used by the teacher involved posed and framed questions to facilitate dialogue among the students. To someone used to traditional structured classroom settings, the high level of discourse in the class might have at first appeared disordered.

During one recess, a few children could be observed remaining in the classroom. They were using the software construction kit HyperCard to build their own interactive learning software and were proud to share their constructions with the observer. After recess, teams of children began to explore further the topics that they had started investigating before recess. While some students remained in their desks, others went to the hallway, some went to the cloakroom, and others sat by the computers. All of the groups were discussing, writing and drawing.

The teaching approach that was observed seemed to depict constructivist teaching (Fosnot, 1994). After much discussion, it was decided to apply this approach to teaching the notions of disability that were embedded in the goals of the intended project.

Piloting

The idea was pilot tested. The focus of the teaching was to be friendship, instead of disability, since this was viewed by the teacher to be of broader interest to every child. The teacher also agreed that three basic questions should guide the children's learning. These questions were: What is friendship? What may make it difficult for people to make friends? and How do we include children who may have difficulty making friends? To evaluate the effect of the pilot testing, the teaching was observed by the researcher. These observations continued for three mornings from 9:00 to 12:00. Extensive notes of the teaching processes and students' behaviour were taken. Children were also interviewed while they were engaged in small group discussions and projects.

One special incident during an observation had a direct and major impact on planning for the project outcome. A group of female students approached the observer with the project that they were working on and asked to share it. It was a play which they had just completed on the theme of friendship. Not to disturb others, the students found a place in the hallway where they spontaneously acted out their understanding of friendship. This experience, combined with the other observations and results of the pilot study, confirmed that the observed approach to teaching can lead to tangible results!

Determining the Research Design

Regular bi-weekly meetings followed the pilot test. These meetings concentrated on formulating the research design, developing the material that would be taught, delineating the steps in the constructivist teaching process, and

determining the methods of assessment. These were crucial times since the focus had to be on the concept of disability, the provision of support for those with disabilities, as well as on the teacher's concern of the broader meaning of friendship. A compromise evolved. The main topic would be friendship with its meaning being extended to include students with disabilities.

The next challenge consisted of designing a set of stages for implementing constructivist teaching. The teacher was interested in the overall reflective process while the researcher desired to specify stages involved in constructivist teaching. An attempt was made to develop a model of constructive teaching. After many revisions, an instructional program with clearly specified steps was created.

The subsequent step was to determine the method of assessing children's learning. As part of an ongoing project a set of child assessment scales had been developed to evaluate the children's learning. Quantitative measures would be used to measure children's concept of friendship and disabilities. These types of assessment consisted of paper and pencil tests.

The researcher was also interested in having children express their thoughts through technology such as computers. The teacher, however, proposed to use the children's self-made projects as evaluative evidence of their learning. These projects could include such things as developing a game board to teach about friend-making; creating plays, songs or stories; and developing educational software. As a compromise, it was decided that the assessment would make use of a combination of quantitative and qualitative methods. Moreover, the teacher was to be in charge of classroom teaching and the researcher the assessment. Thus, through this collaboration and compromise the research design was completed.

Results: Phases of Teaching-Learning

The collaboration resulted in the specification of a number of stages that could be used as a possible model of constructivist teaching. The first stage could be identified as being reflective. In this phase the teacher facilitated a class discussion on the issues and concepts surrounding a curriculum topic. For the purpose of the project, students were guided, through targeted questioning, to think about friendship and children who have disabilities.

The second phase was the research or exploration phase. Students were challenged to learn about the assigned topic by investigating it. Student teams learned about different strategies for collecting information, and then began research on the questions posed during the reflective stage. They were also

provided with direct expert instruction that involved having trained university students teach about the concept of disabilities.

In the third, or reporting phase, the teams presented their findings to the class while the class took notes. In the fourth phase, the analysis, each student team briefly summarized for the class the information presented by another team. The teacher then guided the class to synthesize the key concepts that were presented in the summaries.

During the fifth or building phase, students used their newly found knowledge to create products that would teach other students about the concepts the class had been investigating. Before beginning this building, students wrote a learning plan that described the project, identified its learning goals, and outlined the teaching approach to be used. In the current project, student teams chose to teach about friend-making and children with disabilities by creating such things as a video drama; a mini-musical; interactive software games; a song; a game show; and a board game. The final phase, evaluation, completed the instructional cycle. Students assessed the success of their products through class presentations, and engaged in peer and self evaluation of their learning processes. They also received assessment comments from the teacher.

Reflections

In this collaborative venture, the researcher had an initial interest in testing a theory and searching for a teaching model which would facilitate that test. The teacher was more interested in developing a teaching model based on the experiences and processes of children's learning. At first, it did not seem possible to bring these two different orientations and expectations together. However, through "collaborative conversation" (Hollingsworth, 1992) the two participants became equal partners in the negotiation process. This collaboration involved the sharing of ideas and experiences, the negotiation of the research topic, the development of the content of the program or intervention, and the determination of the methods of assessing the results. A new mutualism emerged. A new teaching model evolved with outcomes that were evidenced by the students' performances, projects and learning.

Through the collaborative process, the partners learned considerably and grew professionally. The researcher expanded her knowledge and understanding of the classroom realities and children's learning while at the same time came to appreciate the ingenuity of children and the thoughts and experiences of the teacher. As a result, existing research dimensions were broadened to include the use of video-taping as a method for assessing children's learning.

The collaborative research process provided the teacher with an opportunity to reflect on teaching. He noted, "I had experiential knowledge that convinced me that constructivist teaching was a powerful way to inspire learning in students. I was seeking a deeper, more precise understanding of how it worked. You, the researcher, came to me with a different instructional and investigative stance which led me to put my experience to the test". Engaging in this collaborative research led to the identification of explicit phases of a constructivist teaching model.

The results of this project demonstrate that a mutually designed and implemented research endeavor can have significant benefit for the parties involved and has the potential to create new knowledge about methods of teaching as well as research. Such possible benefits should motivate other teachers and researchers to engage in collaborative research and practice as equal partners.

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Starting Small and with Uncertainties: Towards a Physically-Grounded Model of Learning from Laboratory Activities

Wolff-Michael Roth

Hands-on activities are said to enhance learning. Until recently there existed no theory that would suggest how practical activity and conceptual understandings might be linked. A case study of cognitive activity is used to show how the theoretical model, developed in this paper, pans out in practice.

Hands-on activities have been an important feature in various educational reform movements. Although many science teachers tried out using hands-on activities, they generally moved away from making laboratory activities a central aspect of their teaching (Tobin, 1990). Research is equivocal about the potency of hands-on activities to assist students in learning the various forms of scientific discourse and in constructing better understandings of subject matter knowledge (Costenson & Lawson, 1986). However, few students actually developed the kind of scientific practices many science education reformers in the 1960s had expected them to develop (Friedler, Nachmias, & Linn, 1990). While problems of implementation including teachers' lack of enthusiasm and problems in classroom management and low student achievement (Welch, Klopfer, Aikenhead, & Robinson, 1981) are cited as factors, other alternatives of explanation for the lack of success of hands-on methods are seldom explored. The most important factor appears to be that there does not exist, in educational and psychological circles, a sound theory which would ground cognition in those neurobiological processes that also ground physical activity (Churchland, 1989) so that it is unclear just what teachers and students have to do to benefit from hands-on experiences.

Toward a Physically-Grounded Theory of Situated Activity

Classical approaches to human cognition assume that language-like structures in the brain constitute the most basic and most important form of representation. Cognition is said to be constituted by the manipulation of these language-like structures according to special rules often those of classical logic (e.g., Anderson, 1985; Inhelder & Piaget, 1958). This classical approach to

cognition which posits some sign system (such as language, sets, and vectors) as the necessary and sufficient condition for any cognitive agent to exhibit general intelligence is known as the physical symbol systems hypothesis (e.g., Newell & Simon, 1976). However, this approach, in which learning is conceived of as the rule-governed updating of a system of sentences or propositional attitudes encountered a wide range of failures to account for empirical data (e.g. Churchland, 1989; Dreyfus & Dreyfus, 1986). In respect to any theory of learning science by engaging in laboratory activities, the problems of classical cognitive science include:

- the failure to account for the preanalytic human judgments of credibility which is the basis of any account of large scale conceptual change of the type that science educators want to bring about in students;
- the failure to account for the perceptual discriminations that make perceptual judgments, which form the basis of learning from laboratory activities, possible;
- the failure to account for the acquisition of the linguistic or propositional system that allows to constitute the beliefs students bring to learning situations;
- the failure to account for the incredible speed with which human agents construct appropriate frames relevant to the current predictive or explanatory problems; and
- the failure to account for the connections between learning of conceptual practices and material practices as is characteristic for science laboratory activities.

Churchland (1989) argued that these failures are suspicious, particularly in the light of the fact that this classical view of cognition is completely disconnected from any theory concerning the structure of the biological brain and the way it might implement the kind of representations and computations proposed within the physical symbol systems hypothesis. These failures constrain any epistemology interested in adequately accounting for human cognitive activities (Dreyfus & Dreyfus, 1986).

My main interest is science education with a particular focus on the performative dimensions of scientific practice as they are encountered in laboratory settings. For the past eigth years, students' actions have been analyzed as they engage in laboratory activities of their own design. These observations and analyses let to a high level of frustration since traditional psychological and sociological theories fail to explain how students learn by doing hands-on activities. As part of this search, a theoretical framework of situated cognition that is consistent with a neurobiological and neurocomputational model of cognitive activity was developed. This framework is briefly outlined in the following paragraphs.

In lived cognition, perception and action are fundamentally inseparable (Clancey, 1993; Varela, 1995). Cognitive activity simultaneously has an inward direction (perception, interpretation) and an outward direction (verbal, physical action). Treating perception and action at the same level is consistent with a neurocomputational perspective because, at the level of the brain, perceptions and actions involve very similar neuronal[1] configurations (Churchland, 1989). At the neuronal level, each experience adjusts the synaptic strengths so that subsequent cognitive activity is always a function of the brains developmental history: both actions and perceptions are therefore always modulated by prior experience. The important part of the neurocomputational perspective of cognitive activity is that knowledge is not encoded in sentence-like structures but in terms of synaptic strengths which, in their totality, turn out to encode tendencies to process stimuli in particular ways. These stimuli are not limited to small numbers of salient and explicit pieces of information but encompass whole situations including the implicit, and therefore not attended to, background that situates any activity.

This view of cognition has considerable implications for science teaching. Because perception and action are always a function of prior experience and the ways to carve up the world are virtually infinite, students' ontologies, the totality of salient elements in any lived situation, are more likely to be different from those of teachers than they are the same (Roth, McRobbie, Lucas, & Boutonné, 1997a, 1997b). Therefore, teachers and/or researchers cannot predict how individual students will perceive or act on some focal situation. Only collective work and experience over long periods of time will allow groups of individuals to be certain that there is a high degree of overlap in the ways they individuate some situation. However, careful attention to students' actions allows researchers to become attuned to the many changes students' cognitive activities are subject to. On the basis of this model, one can expect that cognitive activity will be modified:

- with changes in the situation where the activity takes place (e.g., changes in words used, materials, features) because the salient elements are different;
- over short time scales depending on the number of elements included in a single action (e.g., longer sentences are of greater complexity than shorter ones);
- over long time scales as the cognitive system changes to adapt to, and account for, the lived experiences;
- as a cognitive system differentiates and subsumes elements associated with particular prototypical experiences; and
- as a cognitive system integrates elements to form complexes of associated activities.

Description of Database

The case study of cognition presented in this paper derives from an extended empirical study of learning science in a Grade 6-7 class which I taught during the 1994-95 school year. As part of their regular curriculum, students studied simple machines. Most of the time, students designed and presented their own machines, but the curriculum also included teacher-directed and structured whole-class and small-group inquiries. Students were tested, using a variety of formats, at the beginning and end of this "design experiment."[2] During the four-month long curriculum, students engaged in four types of activities: (a) whole-class discussions over simple machines and teacher-produced visual representations; (b) small-group investigations using simple machines and teacher instructions; (c) small-group open-ended activities in which students designed their own machines; and (d) whole-class discussions in which students' designs were presented, commented upon, and critiqued. The entire curriculum unit was videotaped using two cameras. During small-group activities, each camera followed one student group. Interviews with individual and pairs of students were also videotaped. Two graduate students completed ethnographic observations which were entered into the data base in the form of field notes. All video tapes were transcribed.

For data interpretation, a variety of interpretive and formal data analysis procedures that are common in the area of workplace studies were employed. These procedures include *discourse analysis* and *conversation analysis* (e.g. Edwards & Potter, 1992) and *interaction analysis* (Jordan & Henderson, 1995). These analytical techniques are grounded in phenomenology and hermeneutics and are primarily concerned with constructing understanding of the lived experience of the research participants. The set-theoretic (mathematical) technique of *situation theory* (Devlin, 1991) and *limited formalism and zooming* (Devlin & Rosenberg, 1996) was also used. Situation theory is concerned with formalization of interactions to make the analyses suitable to computer modeling. Limited formalism and zooming integrates the interpretive and mathematical analysis techniques.

To categorize verbal and physical activity in terms of complexity, an empirically-grounded hierarchy was developed as a heuristic (e.g. Welzel & von Aufschnaiter, 1997). Using the tools of situation theory, a formal definition of each level was devised (Roth & Welzel, 1997). This heuristic consists of four major levels separated by three sets of two sublevels (for an example including the first seven levels see Figure 2). These levels describe complexity of cognitive processes rather than static cognitive states and things. Cognition begins when cognitive processes concern *objects* enacted as salient against an undifferentiated ground. The next major levels include cognitive processes concerned with *properties*, *principles*, and *systems*. The intermediate levels

always concern the (a) construction of connections between elements of lower complexity and (b) operation on these elements.

Complexity and Differentiation of Cognitive Activity

Science educators generally assume inappropriately, as has been shown in a series of studies in high school physics (Roth et al., 1997a, 1997b), that students share their view of the instructional materials and phenomena and events generated with them. That is, for the simple balance beam in Figure 1, a Class I lever, teachers might assume that students will focus on the size of the weights on each side and on the distances of these weights from the fulcrum.[3] However, careful analysis of videotaped student-student interactions with these balance beams reveals that this assumption is ungrounded.

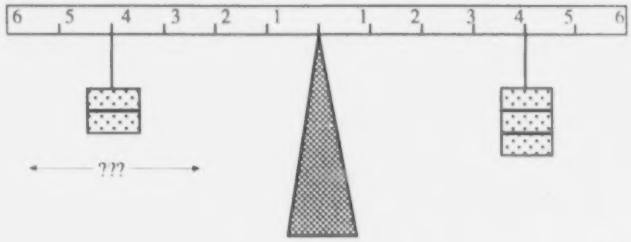

Figure 1

Balance beam (Class I lever) as used by the students in this study. Through the eyes of someone without experience, it is not clear what the relevant elements are for balancing the beam.

In the course of the unit on simple machines, three types of changes were observed: (a) the complexity of students' cognitive activity increased within short time spans of the order of a few seconds to a minute; (b) the average maximum attained complexity increased over the course of the unit; and (c) the number of elements attended to by students increased in number as they engaged in the activity. The first type of change is evident in both graphs of Figure 2 which plot the complexity of a grade 6 student's (Jon) activity for the pretest and posttest interviews. Correspondingly, the average complexity of the actions shown lay between the levels of *operations* and *properties*. That is, during the interview he began by identifying *aspects* of the lever such as the metal nuts (serving as weights), positions of the weights along the lever arms, the fulcrum, and so on. Later, and concurrently with moving weights along the lever arm, he developed operational notions (what to do) to balance the lever: he moved the weights or manipulated the fulcrum to make it turn more easily. Subsequently, he used the rudimentary distance notion of "from here to there."

The second type of change in cognitive activity can be discerned by comparing pretest activity with posttest activity. Figure 2 illustrates that Jon's ac-

tions were of a higher average complexity. He consistently coordinated changes in one *property* (distance) with those of another (weight). However, he did not coordinate the continuous covariation of two *properties* which would have put his actions to the level of *principle*. Thus, one can ascertain that Jon's actions were at the level of *programs*, but there is not enough evidence that cognition was enacted at the level of *principles*.[4]

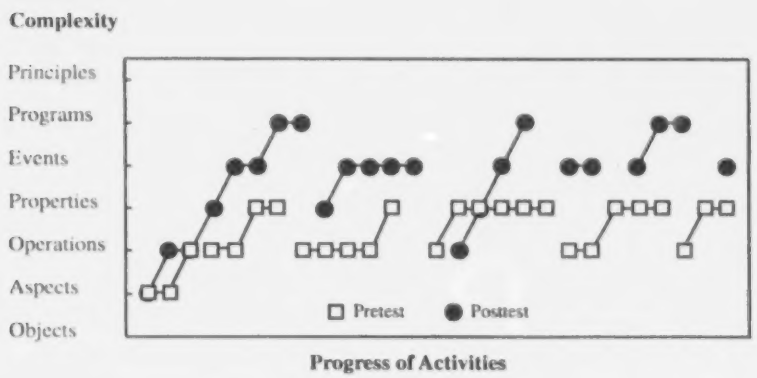

Figure 2

Complexity of Jon's material and discursive actions as he engaged with a balance beam (Class I lever) during the pretest and posttest interviews.

In the first two types of changes, it can be observed that the ontology of students' actions changed. In the course of their activities, students enacted increasingly complex (material and discoursive) operations by coordinating and combining operations at lower levels. That is, they acted in worlds populated by increasingly complex elements and consequently their ontology of the situation had changed correspondingly. The third type of change of students' actions also affected their ontology by increasing the number of elements at each level. Thus, in the case of Class I levers, the balance beam in Figure 1, some students first began to identify the weights as relevant p*roperties* of the balance beam. Only after considerable experience with levers, did they identify and act on the distances of the weights from the fulcrum as relevant *properties*. Thus, an increase in the number of elements at the *property* level can be observed. Such an increase in the number of elements at a particular level can also be viewed as a differentiation of the level (Welzel & von Aufschnaiter, 1997). The following case study illustrates the changes in the ontology of one student as he engaged with the balance beam (Figure 1).

Jon, as most of his peers, did not come to the science unit about simple machines with a canonical ontology of levers. Whereas scientists, most science teachers, and other individuals with lever experience immediately concentrate on the weights and their distance from the fulcrum, novices do not (Metz, 1993; Roth, 1991).[5] The present case study shows how Jon built up "distance" as a relevant *property* of levers. Initially, Jon answered the interviewer's ques-

tions about where to put a weight to balance the lever in terms of locations where the weights need to be placed using the indexical label "here." Later he also included "there." In each case, his utterance coincided with a pointing gesture. He thereby anchored the utterances in the material situation. That is, in the initial phases of engaging with the balance beam, specific locations along the lever arm were *aspects* that Jon isolated from others. His ontology (Ω) consisted of the set $\Omega 1$ = {here, there}.

In the course of the first interview and throughout the activities, Jon, like many of his peers, built up an understanding of distance through *operations*. As part of the interview, Jon changed the position of the weights along the lever arms. That is, he operated on specific *aspects*. His ontology now had changed to $\Omega 2$ = {here, there, MOVE[weight]}.1 We then observed that Jon's answers to the interview questions changed to include the descriptors "from here to there" and "between here and there" to result in an ontology $\Omega 3$ = {here, there, MOVE[weight], "from here to there", "between here and there"}. The first of these utterances coincided with his action of moving the corresponding weight along the beam; the second utterance was initially associated with a gesture pointing by the index finger but changed into a gesture of difference as "here" and "there" were indexed by the thumb and index so that the span between the fingers actually indicated a distance. Here the elements integrated two *aspects* and an *operation* and therefore constitute the rudiments of a notion of distance as a relevant property. That is, his ontology changed to include elements of a higher complexity. In the end, Jon began to use the notion of distance in the context of lever problems. His ontology relative to the property of distance had expanded to $\Omega 4$ = {here, there, MOVE[weight], "from here to there", "between here and there", distance, CHANGE[distance]}.

Despite the presence of distance as a property relevant to lever problems, the distances students individuated initially were not those between the weights and the fulcrum. Rather, the distances salient to them included those from the end of the beam to the weight, or the distance a weight had been moved. Only with experience did students act upon the distance of a weight from the fulcrum and thus make this distance a salient property of levers.

Discussion

An approach to cognitive activity that makes it possible to establish an integration of material and conceptual activities has been outlined in this paper. This integration is possible because both types of activity are grounded in a model that is consistent with a biological and neurocomputational models of brain and brain activity. This model is also much more sensitive to the individuality of students' experiences and therefore forces science educators and science teachers to reconsider their traditional conceptions of what learning

science is all about. It is evident that memorizing verbal rules and factual, language-based information does not enhance students' ability to think more scientifically or enable them to engage in scientific activities in more competent ways. Rather, Jon's example shows that students' ontologies, or the things they perceive and understand, arise from engagement with the world. The present research suggest that essential elements of understanding in a domain (as levers) come from having a body and acting in the world. Students' ontologies are not pregiven and are rather flexible. Thus the "starting with uncertainty" in the title. As students gain familiarity, the number of elements at a particular level cognitive complexity increases ("starting small"); eventually, these elements can be enacted as complexes, ordered synchronically or diachronically, to constitute elements of higher complexity (again, "starting small").

The results of this study have considerable implications for researchers wanting to model cognition and learning in realistic settings. Elman (1993) noted that the learning of a computer-based neural network model increased dramatically when the network's capacities allowed data to be processed only partially or limiting complexity of data seen by the network. The case study illustrated that a student's initial ontology was fairly small in size. With experience of acting in the setting (domain), the ontology increased and so did the complexity of their actions. In new situations, cognitive activity was concerned with reduced ontologies; there are few salient elements and relations (actions). With familiarity in a particular situation, the number of salient elements increases. Elements are also linked and build up into more complex elements. In the process, ontological uncertainty afforded a great deal of flexibility to cognitive activity and therefore learning from activity. Although the retinal stimuli generated by some focal situation may have been constant, the perception of this apparatus changed because of students' experience. Thus, although the curricular materials may have only one meaning for the teacher and within the community of scientists, it may have quite divergent meanings for learners because they are not enculturated in particular ways of seeing and classifying a domain.

The theoretical view of knowing and learning outlined here has important implications for science instruction where laboratory activities and demonstrations are used by teachers to "show" students instances of concepts to be taught. These concepts are realized in the brain in the form of particular neuronal configurations. However, it takes these same configurations to perceive the structures described by a concept label so that students are in a double bind. To learn the concepts, they need to see specific instances associated with a concept label. However, to see the specific instance of interest to science, they need to know the concepts. Teachers therefore need to be thoughtful of the double bind and set up learning experiences that permit students to

bootstrap themselves out of this double bind.

Reflective Coda

Studies like this, though they may be driven by theoretical interests, have and can have great significance to teaching. Over the years, I used video cameras to record and later observe with leisure what students did in response to the activities I designed. In this way, I learned a tremendous amount about learning and how to adjust my teaching strategies to improve the learning environment. When I began this study as the teacher of these Grade 6-7 students, I was not aware of the fact that students may have a different ontology. I expected that when provided with appropriate activities, they will come to an understanding of the relation between weights and distance in the context of levers. However, the activities I designed in the present study, despite my long experience as a science teacher, made some students focus on the number of metal nuts that served as weights and on the numbers marked on the lever beam (see Figure 1). What these students did not have to do was understand the lever but they only manipulated the numbers salient to them. I observed then that some students manipulated numbers according to some algorithm (often invented), rather than trying to use a qualitative understanding of levers to guide their answers. In my view, it is through this type of reflection on our practice, aided by video recordings of classroom activities, that we as teachers can improve our teaching, and thereby improve the learning of the students in our care.

Acknowledgments

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[1] It is custom in the field of cognitive science to use the adjective neuronal when the referent is a biological neuron but to use neural when the referent is a computer-modeled neuron.

[2] In "design experiments," data are used to generate hypotheses about learning which are immediately tested in the experimental situation. In this way, learning and teaching can be optimized and research consists of documenting and theorizing the change. Results from past studies of cognition in classrooms showed that in this way, theory-building about learning and teaching processes is accelerated by an order of magnitude.

[3] The lever in Figure 1 is balanced when the torques on the right and left side are equal. As the torque is proportional to both weight and its distance from the fulcrum, it can be found by multiplying weight by distance. Another way of looking at it is to think that the ratio of the weights has to be the inverse of the ratio of the corresponding distances.

[4] Teachers often assume that when students can solve a balance beam problem that they understand the device. However, students may actually use a some rote algorithm or a memorized formula, to solve pencil and paper lever problems without understanding the device or the inverse relationship between weight and distance.

[5] Even most college students need considerable time until the distances between weights and fulcrum are within their interpretive horizons and therefore elements of their ontology (Hardiman, Pollatsek, & Weil, 1986; Roth, 1991).

[6] In the interview situation, we required one side of the beam to be fixed. That is, students could change neither weight nor its distance from the fulcrum.

BEST COPY AVAILABLE

Preventing School Violence by Building Connectedness: A Local Initiative

Mary-Wynne Ashford

Successful school violence prevention programs bring alienated young people into relationships with others and help them find meaning in life and a sense of belonging. An initiative is designed to improve relationships of a minority group of First Nations children with their peers in two schools.

This project arose as a result of being invited to consult with a rural elementary school because of problems between a group of First Nations students in grade seven and other students in the school. This school in the Sooke School District is participating in a major violence prevention study directed by Riecken and Artz.

Research conducted by the author on violence prevention programs in schools is relevant to Native students because some Native traditions may be effective in reducing violence. In particular, the Native concept of *connectedness* is useful as a guide to assessing whether a program is likely to be effective. *Connectedness* in this context is used to indicate that humans are part of a seamless web of creation in which each person is related to all others and to the earth; and furthermore, that the spiritual dimension of creation is central to life.

Examination of successful school violence prevention programs reveals that they build connectedness between alienated young people and various dimensions of their lives—their relationships, their environment, their sense of purpose in life, and their belief system (Ashford, 1996).

Boredom and adolescence

Alienation and disconnectedness are often revealed when adolescents complain of boredom. For example, when young offenders are taken into custody and asked why they committed their offense, the most common answer is, "I was bored" (Hogg, 1994). Taking this response seriously means asking why

boredom is an intolerable stress for some adolescents, and what might be done to reduce it. Boredom is a complaint of both Native and non-Native young people, although the causes and the meaning of the term may differ between individuals.

Boredom can be considered as having two forms: the transient irritation experienced by most people from time to time, or a chronic, corrosive and dysfunctional state that compels an individual to act to seek relief. The chronic form is described by young people who complain of boredom in their leisure time as much as in school or work. Abundant examples of the term *boredom* in association with anti-social or destructive behavior are found in the lyrics of the recent derivatives of rock music, especially in what is called "Metal" or "Grunge". The lyrics of Green Day's *(1994) Dookie* album provide a convincing illustration of anger, rage, and boredom. Green Day is a California band popular with grade eight and nine students in British Columbia.

The restlessness and frustration of boredom are highlighted in "Burnout", and the thoughts of a suicide bomber in "Having a Blast".
(Capitalization in the originals)

BURN OUT

I declare I don't care no more
I'm burning up and out and
growing BORED
In my smoked out BORING room
. . . I'm not growing up, I'm
just burning out
And I stepped in line
to walk amongst the
DEAD . . .

HAVING A BLAST

I'm taking all you down with me
Explosives duct taped to
my spine
Nothing's gonna change
my mind.
I won't listen to anyone's
last words
There's nothing left for you
to say
Soon you'll be dead
anyway.

The underlying rage and profound disconnectedness from other people expressed in these songs seem to be orders of magnitude different from the role plays studied in conflict resolution and anger management classes where issues raised are somewhat mundane—curfews, allowances, responsibilities in the home, and so on. If violence by the young man in the song above is to be prevented, re-establishing human connectedness with him seems essential. It is also key to helping him find meaning in life.

Let's consider a brief elaboration on boredom in adolescence in order to develop the basis for suggested interventions to reduce both boredom and violence. Boredom may be expressed as a need for increased sensation or as a need to find meaning in life. Programs that provide both excitement and increased meaning are most likely to reduce both boredom and violence. Some of the common ways to find meaning in life and to build connectedness are the following: engagement in a work, a creative endeavor or a movement; service or altruism; relationships; rootedness or a sense of belonging to a group; personal stance toward suffering; spirituality; and responsiveness to beauty in art or nature.

Significantly, Green (1985) describes a similar list important in the development of conscience. He writes of the necessity to attend to conscience as craft, as membership, as sacrifice, as memory, and as imagination. These categories closely resemble meaningful work, belonging, service, rootedness, and creativity. The parallels between the development of meaning in life and conscience seem compelling reasons to address these issues in schools. Connectedness between relationships and work is important to sustaining the meaning of both; connectedness between one's belief system and one's actions is important to behavioral change.

Connectedness is a central concept in many religions, especially those of aboriginal peoples, who often use such a term to describe a notion of harmony of all that has been made by the Creator. The aboriginal notion that problems arise when individuals lose their connectedness can be useful. Native healing circles and evolving practices in Native justice are concerned with re-establishing connectedness of offenders with the community and, through spiritual practices, with re-establishing the offenders' connectedness with their own spirituality and with the rest of creation. If connectedness is restored, it brings a deep respect for others that precludes further offending. Non-Native justice systems could gain valuable insights from these attempts to build justice on principles of community responsibility for determining appropriate punishment and restitution, and later for integrating an offender back into the group. Victim-offender restitution programs take a similar approach to restorative justice.

School Violence Prevention Programs

School violence prevention programs have evolved as a series of components or modules that are often implemented separately. The core of the most common programs includes some of the following: interpersonal communication skills; empathy training; conflict resolution; peer mediation; anger management; bullyproofing; bias awareness; parenting skills; and modification of school atmosphere. Some school programs have also been developed that apply Hirschi's (1969) social control theory (increasing bonding to the school; commitment to conventional activities; involvement in activities important for the student's future; and moral reasoning or belief). These programs are important because they are based on a well established theory of delinquency prevention. Glasser's (1990) *Quality Schools* approach is sometimes described as a violence prevention strategy based on control theory that Glasser has adapted from industrial management. One unusual approach to violence prevention is the use of stress reduction training for students and teachers—a remarkably effective intervention (Hamilton, Hare, Hierlihy, & Kilbourn, n.d.; Wilson-Brewer, Cohen, O'Donnell, & Goodman, 1991).

The most commonly used program in British Columbia elementary schools is *Second Step*. This program, developed by Seattle's non-profit Committee for Children, teaches empathy skills, communication, conflict resolution and anger management. Teaching techniques in violence prevention programs are interactive and experiential. Teachers model the strategies and use storytelling, small group discussion, role play, simulation games, and rehearsal of new "scripts" or habitual responses to engage children with observed and direct experiences.

The question that most concerns educators who must choose programs to implement is "What have we learned from the evaluations of existing violence prevention programs that might inform future efforts?" Unfortunately, empirical evaluations lag far behind program implementation, and most evaluations do not measure *behavior* of individuals before and after an intervention, in comparison with a control group. Rather, they measure changes in *attitudes*, generally in the form of self-reports, without being validated by official records of *behavior*, such as suspensions, arrests, or charges laid. Despite these shortcomings of the existing literature as a whole, some valuable studies have been conducted that permit us to draw several conclusions about what is most effective and what directions show the greatest promise.

First, it is important to recognize that the school is only one of several institutions and agencies (e.g., family, justice system, government ministries, community organizations) concerned with preventing adolescent violence. Studies show that interventions in high-risk families are consistently the most ef-

fective strategies for preventing adolescent violence (Tolan & Guerra, 1994). Three strategies in particular have been found to be effective: training parents in behaviors that decrease coercive relationships; supporting the emotional cohesion and shared beliefs of the family; and helping the family respond to external pressures such as unemployment. These strategies are important to educators because the first two can be incorporated in parenting courses in schools, and the third may be a basis for collaborative action with school counselors and community agencies. The finding that less coercive relationships with youth lead to less violent behavior provides support for proactive non-coercive strategies of classroom management. From the surveys of empirical research (Wilson-Brewer *et al.* 1991; Tolan & Guerra, 1994) three strategies have been found effective. The first is increasing parental involvement - particularly parental access to teachers, parental support for school activities, and increased opportunities for parents to have a valued role in the school. The second type of successful intervention is improving student motivation to attend and perform in school and engage in prosocial community activities. The third approach is to offer youth in general more opportunities for prosocial involvement in communities.

Project in Progress

Purpose: The purpose of this research is to measure the effects on violence of an intervention to reduce racism and social isolation of Native students in two predominantly white schools, one elementary and one junior secondary. The project begins with the adults involved—the Band parents, school staffs and community leaders (phase one) - and leads to targeted expansion of the existing violence prevention programs in the schools (phase two). This research assumes that the hostilities between the Native children and their peers reflects, in part, the social and physical isolation of the Native Band from the larger community. The results of the work with the adults will determine the specific programs recommended to the schools.

Background conflicts in the community affect relationships in the school. There is hostility between the Native Band and the school, as a legacy of residential schools; between the Band and the larger community, as a result of a proposed casino on the Reserve; and between the larger community and one school, as a result of a public conflict about school equipment. In addition, the Band is divided into two families with conflicting claims on leadership. Without some attempts to build links among these groups, the existing school violence prevention programs are unlikely to be effective.

Implications of Research

If strategies developed from this research are found to be effective in building a sense of belonging for the Native students within the school and community, the long-term effects will be very important, not only for the education of the Native students, but also for the harmony of the whole community. The lessons may be applicable to other school conflicts involving minority groups. Expansion of this pilot project to the larger Sooke community is the intended next step. It is hoped that the project will contribute to reducing the school drop-out rate for Native children.

Method

The initial stage of the project involves information gathering by a team of investigators to clarify the strengths as well as the sources of conflict between the Band, the school and the larger community. A graduate student will research and provide background documentation of the history of the areas of conflict between the Band, the school and the community.

The information and insights collected will be shared with the groups in order to open the way for improved communication and interaction. This process might be considered as "cultural diplomacy". The goal is to make possible discussion of strategies to deal with grievances. The ideal would be to have all the parents work toward a super-ordinate goal of providing the best possible school experience for all the children.

When the areas of conflict are clarified and sufficient trust has been established to begin joint discussions of strategies, background information about relevant initiatives that might be useful will be offered, and, where possible, implementation of the programs chosen will be facilitated.

Evaluation

Evaluation data will include:

1. Comparison of the number of reported incidents of school aggression or violence involving the Band children as perpetrators or victims before and after the interventions. Although playground observation would reveal more subtle incidents, targeting a minority group for close observation on the playground might be seen as discriminatory; therefore, the less intrusive measure of comparison of records is chosen).

2. Analysis of interviews of parents, school staff, community leaders and selected Native and non-Native students at the beginning and end of the project.
3. Comparison of the number of school suspensions of the Band children before and after the interventions. Suspensions as a disciplinary measure are viewed very negatively by the Native people. A change in this measure may reflect either a change in behavior of Band children, or a change in the policies or attitudes of school administrators.
4. Comparison of the school involvement of the Band parents before and after the project. This may be measured by attendance at Parent Advisory Meetings or Parent-Teacher interviews or other events. Attendance at PAC meetings has been identified by parents in both the Native and non-Native groups as a source of tension. Increased attendance would indicate a decrease in this tension.

Progress Report

At the first meeting with the Band, the Native leaders raised the possibility of a project involving drama or role play as a tool to decrease racism. This idea generated considerable excitement and enthusiasm because it is congruent with traditional storytelling as a tool for conflict resolution. A further suggestion from the Native leaders was that the project could include student mentors from Pearson College of the Pacific (a nearby international college very highly regarded by the Band). The College has previously encouraged students to work as mentors on the Reserve.

A drama project could be a rich source of meaning for both Native and non-Native students. It has the potential to build close relationships, to increase pride in personal heritage, a sense of belonging to something outside oneself, a sense of meaning in the suffering experienced in racial injustice, an understanding of Native Spirituality, and a creative outlet for all the participants. All of these factors are likely to increase connectedness. Performing involves risk-taking and thus also fulfills the need for excitement.

The development of this project must come from the children and adults involved, with the researchers facilitating communications where possible. The power of the intervention is in the deep involvement of the participants in resolving their conflicts through their own strengths. At this early stage, the humor, patience and underlying goodwill of all the adults involved give some basis for optimism.

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Violence, Gender and Differential Socialization: Examining Male-Female Differences in the Youth Violence Project

Ted Riecken and Sibylle Artz

The goals and some of the results of the Youth Violence Project, a community based violence prevention project involving the Faculty of Education, the School of Child and Youth Care and School Distict 62 are described in this paper. Several of the gender differences that are apparent in the projects initial results are highlighted.

Overview of the Project

The project described in this paper is a collaborative community based initiative designed to address the problem of youth violence in a Vancouver Island School District. Building upon research conducted by the University of Victoria in 1993-94, the project involves representation from the University of Victoria (School of Child and Youth Care and the Faculty of Education), teachers, counsellors, parents and students from School District 62, and representatives from health care and social service agencies. The overall project consists of thirteen individual anti-violence initiatives located in sixteen schools. These initiatives have been developed by school-based health teams in each of the local school communities. The health teams include the involvement of over 60 parents, 118 students, 60 educators and 20 local agency workers. The project serves over 5 400 students, their families, and their educators and is committed to educating and training students and community members in a preventative approach to violence. Its intent is to foster changes in behavior in individuals and have them acquire skills that would help them to act differently in circumstances that previously could have elicited violent responses.

The research dimensions of the project focus on the evaluation of the effectiveness of the various initiatives using a model of participant based program evaluation. Given the recent rise in youth violence in Canada, the research findings address a serious gap in the research literature on the effectiveness of school-based anti-violence and violence prevention programs (Johnson & Johnson, 1996). Evidence from school systems across the country indicates that violence among young people is on the rise. Such evidence is corrobo-

rated by data from Statistics Canada that shows a 102% increase in violent offence charges laid against Canadian youth since 1986 (Frank, 1994). The importance of this project lies in the pressing social concern that violent youth crime presents to Canadian society. This project aims at reversing the trend in rising youth violence by addressing the problem in a preventative way, beginning in early childhood, with age appropriate initiatives implemented at the elementary, middle school, junior secondary, and senior secondary levels. In addition, a significant component of the thirteen initiatives focuses on parent education, problem solving and conflict resolution in family settings.

Development of Initiatives.

This project was funded by the British Columbia Health Research Foundation's Community Research Grants program. Under the conditions set down by the granting agency, all research projects had to involve the community at a variety of different levels. For the purposes of the project, this involvement is at the level of the school and includes school based Health Teams. The team is made-up of interested parents, teachers, students, administrators, and community based human service workers (i.e. Child and Family Counsellors, and Public Health Nurses). In the early stages of the project, the Health Teams provided a forum for discussing what community members felt should be the focus of the community's violence prevention initiatives. Based on these discussions, intervention strategies that best met the needs of their community were selected by the teams.

As part of this initial planning process, members from the University of Victoria's research team met with the individual Health Teams to assist with the planning of the evaluation of the interventions that had been selected. In most cases, the evaluation process consisted of data collection before and after the intervention, with a subsequent analysis of the data providing information about the program's effects. The University research team's role in this process consisted of helping select and/or design data collection instruments in the form of parent and student surveys and questionnaires. Playground observation protocols were also developed and administered by members of the Health Teams with the help of the University based researchers. Data that were collected for the various projects were stored at the university and are currently being analyzed by the research team.

Project Descriptions

A brief description of the project goals for the thirteen individual projects are provided in the following section.

PROJECT 1—Kids' Individual Differences:
Spanning the district's Kindergarten program, the objectives are to in crease/expand kindergarten children's knowledge and awareness of each others individual differences at this level and to introduce literature based on individual differences into the classroom.

PROJECT 2—Moving Beyond Second Step
(Metchosin, Hans Helgesen, Sangster and David Cameron Elementary Schools):
The objective is the prevention of victimization and verbal and physical bullying at the four elementary schools. This project involves parents and students in *In Step* (1995) which is an expansion of the *Second Step* (1992) program (1992) that is designed to introduce parents to the violence prevention curriculum their children are exposed to at school.

PROJECT 3—Moving Beyond A Code of Conduct
(Dunsmuir Junior Secondary School):
This project involves students, parents, educators and community agency workers and addresses aggressive and violent behaviours and works to prevent them by: increasing awareness about the kinds of violence that exist; educating students about what kind of behaviour is acceptable; and reducing the number of incidents of violent and aggressive behaviours among students.

PROJECT 4—Preventing Violence Before It Starts
(Lakewood Elementary):
The design of this project addresses violence before it starts. Lakewood Elementary is a new school, having opened its doors in January of 1995 and as such, the staff and parents are working proactively to build a positive classroom and playground culture that promotes a healthy approach to interpersonal relationships and school yard interactions.

PROJECT 5—Enhancing the Parent-School Relationship
(Millstream Elementary):
The focus of this project is on developing a sense of community among students on the playground and between the home and the school. The school has introduced a wide variety of sporting equipment that promotes team games at noon hour and recess. This is based on the assumption that much negative school yard interaction is the result of a lack of opportunities to engage in positive play.

PROJECT 6—Dealing with Intimidation and Bullying
(Spencer Junior Secondary):
The School Based Health Team at Spencer Junior Secondary School has focused its efforts on raising students' awareness of the forms and consequences

of violence and making students aware of alternatives to violence in the form of healthy recreational pursuits available in their community.

Project 7—Changing Values and Beliefs
(John Stubbs Elementary School):
The overall objective of this program is to promote the development of a non-violent belief system in the community by helping all facets of the community become aware of techniques that provide effective, positive results for the prevention and management of various forms of violence.

Project 8—Preventing Vandalism
(Wishart Elementary School):
This project focuses on reversing an escalating trend (1992-95) of student participation in vandalism, property damage, theft and intimidating and threatening behaviour. The objectives include: reducing bullying and increase positive peer contact; developing and implementing school anti-violence policies and a code of conduct (with student involvement); and providing positive student-adult and student-student contacts and activities through the school's Learning Centre.

Project 9—Promoting Healthy Relations
(Belmont Senior Secondary):
The focus of this program includes three aspects of building healthy relations: developing positive relations and mutual respect between students and teachers, among students themselves, and between adolescent boys and girls; providing mentoring, support and positive role models for the teenaged parents who attend Belmont School; and involving teenagers as role models for young children at a nearby elementary school.

Project 10—A Family Based Approach to Violence Prevention
(Sooke Elementary School):
The overall objective of this program is to provide parents and children with training in non-violent methods of problem solving and conflict resolution. At the same time, an attempt is made to reach out to the community by helping students and parents incorporate the approaches they are learning into other programs and spheres in the community.

Project 11—Bully Proofing: A Student Team Based Approach
(Journey Middle School):
The objectives of this project are to: create student parent and community awareness about bullying; build a partnership among parents, school and community which focuses on addressing youth violence; teach assertiveness and life skills; develop and expand peer mediation; implement student-directed means for reporting and investigating reported incidents of bullying; increase

accessibility of mediation services at the school; and produce and utilize various forms of media to convey violence prevention messages.

PROJECT 12—A Head Start on Violence Prevention
(Edward Milne Community School):
The objectives of this project include raising an awareness among students, teachers, parents and community members about definitions and perspectives of violence against self and others; changing attitudes which condone and contribute to violence; and providing skills training which will lead to non-violent behaviours.

PROJECT 13—An Alternative School-Based Intervention
(Spencer Flex Program):
The objectives of this program include involving at-risk students with high achieving students and thereby engaging the former in pro-social behaviour through inclusion in positive experiences of the school community and decreasing academic failure and drop-out rates among at-risk students, thereby preventing their drifting towards deviant and delinquent behaviour.

Findings Across the Sites

A number of interesting results are beginning to emerge from the data collected at the different sites. For the purposes of this paper, some of the gender based differences that are apparent in participants' responses to violence prevention programming are highlighted. One area where differences appear is in the participation rates of fathers and mothers in the parent education components of the project. During the 1995-96 and 1996-97 school years, seven of the project schools have implemented the *In-Step Program* which consists of a series of four evening workshops for parents and is designed to introduce them to the content and skills their children learn in the school's anti-violence curriculum. In each of the sites where the *In-Step Programs* have run, the number of women participants have greatly outnumbered men. At this point, the reasons for such differential attendance are unclear. One possible explanation might be that the primary responsibility for maintaining contact between home and school has traditionally fallen to mothers, and the low attendance by fathers could be a reflection of this historical pattern. Another explanation that may have some credence is that men and women see the issue of violence through different conceptual frameworks, and thus, they attach different levels of significance and concern to it as a social problem. Support for this perspective can be found in the data collected from the school district's adolescent population as part of an earlier study (Artz & Riecken, 1994). Surveys conducted at four different schools each show a clear gender based split on the topic of violence both in terms of actual experiences with it,

and in terms of the attitudes and values that shape how one lives with violence as a social phenomenon.

School incident reports, which contain information about violent incidents and infractions of the schools' behavior policies, show that the vast majority of violent incidents in the school community involve boys rather than girls. Data from the 1994 study (Artz & Riecken) show that for boys violence is a bigger part of their lives than it is for girls, with boys being twice as likely as girls to be the victim of a gang, and three times as likely as girls to be attacked on the way to and from school. Girls, on the other hand, experience violence in the form of sexual abuse at a rate four times greater than boys, and they suffer more physical abuse in the home than boys do.

Attitudinal stances toward violence also differ between the sexes with boys being more likely than girls to endorse violence as a solution to problems, and less likely to condemn its use. It is clear then, that as a social phenomenon, notions about certain aspects of violence differ for males and females. As an element of one's lived experience, the nature of the violence one encounters seems to be to a large degree pre-conditioned by one's gender. Boys experience more violence than do girls, but do not have it tied to their sexuality in the same way that girls do. Since boys live in a cultural milieu that exposes them to more violence than is the case for girls, boys also appear to accept violence more readily.

In large part, boys' greater tolerance for violence may be due to the modelling of violent behavior that they see in the world around them. Traditional notions of masculinity in past and present day society include an emphasis on physically aggressive behavior. Many sporting and recreational activities that young men engage in include aggression as an element of play. From video games and rap music, to organized sports such as hockey and football, the theme of culturally sanctioned aggression in nearly ubiquitous for young males in today's world. As a result, when compared to girls, boys not only see violence as less of a problem, they are also more resistant to changing their attitudes and beliefs about violence. Research results indicate that boys are less likely to adopt the anti-violence messages of their schools' violence prevention programs[1], and are far less to participate in student groups that promote violence prevention. Three of the project schools have adolescent student groups that have assumed a strong leadership role in developing student awareness around the issue of violence as a social problem. In each group, girls outnumber boys by a ratio of three to one. When asked about the reasons for their participation, many of those boys who are involved indicate that they have been victims of violence and intimidation and they wish to prevent it from happening to others. Girls' involvement, on the other hand, seems to stem not so much from having been victims themselves, but more

from a desire to help put in place a clearly articulated personal vision of positive social interaction for their school and community.

Whether the lack of involvement on the part of the boys is simply another manifestation of the general trend toward non-involvement of boys in school culture (Clark, 1997), or whether it is more directly related to male attitudinal and conceptual frameworks affecting boys' cognitive constructions of violence as a social issue, is not clear. However, it is worth noting that a similar situation exists in the anti-nuclear war movement in that seventy per cent of the activist physicians in the peace movement are female (Ashford, personal communication, January, 1997).

Influence of Parental Attitudes and Beliefs

The situation of differential male-female involvement in violence prevention programs and differing male and female perceptions about the seriousness of violence as a social issue is of particular importance when viewed in the light of recent data regarding the impact of fathers' and mothers' attitudes on children's values, attitudes, fears and behaviours in relation to violence. Analysis of a recently completed survey of parents' experiences, attitudes, values, and dispositions towards violence indicates that more male than female parents reported participating in bullying when they themselves were in school. Yet, more female than male parents reported perceiving bullying as a serious problem requiring action. More female than male parents also reported believing that bullying is preventable. For children who reported high levels of involvement in aggressive and violent behaviour, the parental variables that correlated significantly with that involvement were: a parent of either sex having been a victim of bullying as a child, or being rated as a victim by their mothers[2]. Parental variables that correlated with children reporting high levels of fear of vicitimization were mothers' reports of having been a victim and mothers' perceptions of their children as victims.

With regard to children's self-esteem, fathers' support for reporting bullying to parents or teachers, and fathers' endorsement of positive social/interpersonal values are positively correlated, whereas mothers' endorsements of these values appear not to yield a similar positive correlation. The pattern of fathers' endorsement of pro-social behaviour as seemingly central to prosocial development continued with regard to children's endorsement of positive social/interpersonal values. The parental variables that correlated with high levels of children's self-reported endorsement of pro-social values were fathers' endorsement of positive social/interpersonal values, and mothers' self-reported history of vicitimization, (i.e. if mothers reported having been victimized by bullies when they were students, they were also likely to have

children who placed greater importance upon positive social/interpersonal values). The reasons for such differential impacts by fathers and mothers are not clear, and why such is the case is indeed, puzzling. Common sense might lead one to conclude that as the primary care giver and the person most often involved with home- school contact, the mother would have the greatest impact on children's developing self esteem and pro-social attitudes and values. However, such does not seem to be the case.

It is important that these findings are presented with the cautionary note that the sample size for this portion of the study is rather small, consisting of thirty-eight matched mother-father-child triads. While it is the intention to further investigate this phenomena, these findings tentative as they are, seem to indicate that the father's influence on children's social development is potentially pivotal. This result, combined with the well documented differential participation rates of men and women in violence prevention initiatives, and the differential degrees of adoption of the messages conveyed by anti-violence curricula by adolescent boys and girls, indicate that the gender dimensions of violence as a social phenomenon are exceptionally fertile grounds for further study. It is the intent to pursue further related investigations in these directions.

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[1] The differential adoption of anti-violence curricula by adolescent boys and girls is a finding that has been replicated at three of our project schools using pre and post intervention attitudinal measures.

[2] All correlations mentioned in this section are significant (p=.05 level).

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Caught in the Middle: A Counselling Program for Children of Divorce

Geoffrey G. Hett

Caught in the Middle is a counselling program developed to help children deal with the issues and concerns that often accompany divorce. The results of the research conducted to measure the effectiveness of this program are discussed.

Parental divorce is a process that can endure over time and touch on every aspect of the lives of those involved. Since the majority of divorcing couples have children who are presently minors, concerns about the developmental well-being of the future generation exists. It is estimated that 40% of children under the age of 18 years in Canada presently reside in non-traditional families (Haveman and Wolfe, 1994) and that one-half of the marriages in Canada (Dumas & Peron, 1992) and two-thirds of the marriages in the USA (Bumpass, 1990) will end in divorce.

A review of the literature on family separation and divorce in the early 1980s indicated that despite the rapidly growing incidence of family dissolution, there existed a noteable lack of Canadian research on the implications of family breakdown. It appeared that three areas required attention: (1) an investigation of the impact of family dissolution on the educational, social and emotional adjustment of Canadian children, (2) the development of a program to meet the needs of these children, and (3) an assessment of the efficacy of such a program.

Research in this area (Hett 1983, 1985) showed evidence which suggested that family separation and divorce is a factor associated with children's school-related problems. Differences between children from separated and intact families in such areas as academic achievement, emotional adjustment and such school-related problem behaviours as "acting-out" existed. Significantly more children from single-parent families evidenced problem behaviours than children from intact families. These behaviour problems included poor concentration skills, lower achievement, a greater need for learning assistance instruction and problem behaviours resulting in disciplinary action.

During the past two decades a voluminous body of literature from the USA has been published which explores the potential deleterious impact of paren-

tal divorce on children (McDermott, 1970; Morrison, 1974; Schaettle & Cantwell, 1980; Wallerstein & Kelly, 1980; Golombek, Martin, Stein & Koremblum, 1984; Bonkowski, Beguette & Boomhower, 1985; Brady, Barry & Zeeb, 1986; Kalter, 1987; Robson, 1987; Wallerstein, 1991). In general, these studies have concluded that children from divorced families do experience lower levels of well being on a variety of educational, psychological and social measures, than do children from intact families. Evidence also exists that suggests that even as adults, children of divorce exhibit lower levels of well-being than children who continuously live in intact families (Wallerstein, 1991).

The information from this research resulted in a counselling program called *Caught in the Middle* (Achtem & Hett, 1988). The goals of this program are to assist young clients with: understanding that they are not alone in the issues and concerns that they face; dispelling the notion that children are somehow responsible for their parents' divorce; acquiring effective communication and assertiveness skills that will allow them to express their concerns and needs in a clear and objective manner; mastering problem solving strategies; reducing stress and anxiety through the use of muscle relaxation, and finally; controlling their anger. A set of vignettes accompany this program. These vignettes display typical problems faced by children of divorce and are designed to be helpful in stimulating and promoting discussion on sensitive issues and in teaching problem solving skills. A relaxation tape for children experiencing stress and anxiety was also developed.

A variety of school-based and community-based programs, designed to deal with the needs and concerns presented by children of divorce, appear in the research literature. Only a small number of the authors, however, have attempted to evaluate these programs and many of the evaluations rely on subjective appraisals by the group leaders, parents and children participating in the program. Generalizations are further weakened by the failure to include control groups.

To measure the efficacy of the program *Caught in the Middle*, pilot studies and studies involving control groups have been undertaken. The subjects of these studies ranged in age from 6 to 12 years of age and were mostly from white, middle income parents who had separated or divorced and lived in the Greater Victoria area.

Tests to determine the efficacy of this program are administered immediately before and after the completion of each intervention. The instruments employed include: the State-Trait Anxiety Inventory (Spielberger, Edwards, Montuarie & Lushene, 1970) to assess predisposition to anxiety and to situational anxiety; the Coopersmith Self-Esteem Inventory (Coopersmith,

1967) to measure attitudes towards one's self; the Nowicki-Strickland Locus of control (Nowicki & Strickland, 1969) to determine the ability to act independent of others; the Walker Problem Behavior Identification Checklist (Walker, 1978) to assess children's adjustment to school; and the Draw Your Family Test to assess overall adjustment to divorce. Two instruments were developed, the Children's Adjustment to Divorce Questionnaire (Hett, 1991) and the Children's Feeling Expression Inventory (Rose, 1996).

Results from Early Studies

The results from the early pilot and control group studies showed positive effects in several areas. Measures for the control group studies, with the exception of the Draw Your Family Test, were analyzed using the t-test. In one control group study, the children in the experimental group showed significantly greater improvement in their ability to act independently (means of 18.85 and 13.51) than did children in the control group [$t(7) = 2.56$; $p < .05$]. In another control group study, significantly greater improvements were found in the school adjustment of the experimental children (means of 22.75 and 7.28) than the control group children [$t(15) = 2.32$; $p < .05$]. In two studies there were differences between the experimental and control groups on the Draw Your Family Test. Children in the experimental groups showed greater improvement in creativity than the children in the control groups. Isaac and Levin (1984) suggest that shifts in creativity in children's drawings are indicative of their increased sense of well-being. In addition, children enrolled in *Caught in the Middle* included their fathers more frequently in the post-intervention drawings and fathers were drawn larger than they were in the pre-intervention drawings. This seems to suggest that fathers in these families had regained a position of significance in the children's minds.

The results of these studies indicated that little improvement was made by any of the groups in anxiety or self-esteem. Several reasons for the program's ineffectiveness at changing these attitudes might exist. First, the counselling program encourages an exploration and expression of feelings. This approach to counselling may heighten children's anxiety and lower self-esteem. Wallerstein et al. (1987) for example, report that anxiety was heightened in their study with the expression of divorce-related issues. Bowker (1982) suggests that the identification and expression of feelings is difficult for some children who invest a great deal of energy in elaborate defenses against feelings. Secondly, anxiety and self-esteem may be very stable dimensions, which resist change over a short term. Pedro-Carroll & Cowen (1985) found a lack of change in self-esteem in their study and suggest that a short term intervention program may not be sufficiently powerful to change this relatively stable dimension.

Audiotapes as an Adjunct to *Caught in the Middle*

Several years ago "talking dolls" were introduced into the research program as an adjunct to *Caught in the Middle*. The toy industry has produced several types of talking dolls. Audiocassette tapes, designed for these dolls, are used to deliver a variety of messages to children. In our program, teddy bears and audiocassette tapes are used with children's voices that deliver messages about issues of family separation and divorce. The topics the teddy bears discuss include: parents' arguments; courts and lawyers; Disneyland dad/mom; mixed loyalties; being used as a spy; mom's boyfriend; dad's girlfriend; broken promises; and step-families.

The use of audiocassette tapes and puppetry are not new to counselling. As Carter (1987) points out, using puppetry in counselling provides children with the freedom to progress at a comfortable pace, gives them control over issues, and provides a deep feeling of safety. As was noted earlier in this paper, many children in the research groups have great difficulty expressing divorce related feelings, and anxiety is often heightened when they are asked to identify and express these personal feelings. It is hoped that by having sensitive issues introduced to children by the teddy bears in the safety of their homes, they will be more at ease with these issues and more able to discuss and deal with their feelings openly and with less anxiety during and after group meetings.

The reaction of the subjects and their parents to this addition of *Caught in the Middle* has been very positive. Interestingly, even the 12 year old boys are enthusiastic about receiving and taking their teddy bears home. The data gathered from pilot studies is encouraging. Improvements in the children's adjustment to divorce and slight improvement in anxiety have been observed.

One control group study has been conducted to measure the efficacy of the added audio-tape program. This study (Rose, 1996) was undertaken as a Ph.D. dissertation. The participants (children 9 to 12 years of age) were randomly assigned to two experimental groups and a control group. The members of one experimental group received the regular *Caught in the Middle* program. Members in the second experimental group received the *Caught in the Middle* program and, in addition, were given an audiotape and teddy bear to take home each week. The topics on the tapes served as the focus of discussion during the subsequent group session. The subjects in the control group did not receive a counselling program.

The major focus of this investigation was on the participants divorce-related feelings and their ability and willingness to share their feelings. To test the intervention effects, an analysis of covariance was performed. The results of

this study showed significant differences across groups on the Children's Feeling Expression Inventory in the subjects' ability to use a rich affective vocabulary to express their feelings (F_2 , 32 = 5.0; $p < .02$) and in their willingness to express their feelings about the divorce to their parents (F_2 , 32 = 6.96; $p < .02$). Children in the two intervention groups developed a greater affective vocabulary and showed a greater willingness to talk about their divorce-related feelings with their parents than did the children in the control group. The children who were provided with the audiotapes and teddy bears demonstrated the greatest improvement in both these areas. It appears that the audiotapes and teddy bears not only served as an effective model to expand the children's vocabulary, but also served as a catalyst for the children and parents to come together to discuss issues and concerns about the divorce. Differences between groups in the children's level of anxiety and self-esteem were not observed.

Future Research

The *Caught In the Middle* program appears to have been successful in helping children act independent of others, improve their school behavior, increase their sense of well being, improve their vocabulary and ability to talk about their feelings and to share their feelings with their parents. The program has had little effect, however, on lowering the levels of anxiety or increasing the levels of self-esteem. There are, however, two studies in the research literature that report improvements in anxiety and self-esteem. Stolberg and Mahler (1994) report a significant decrease in children's anxiety when the intervention for the children included parent participation. Ozimo and Ozimo (1987) found significant improvement in children's self-concept when their custodial parent participated in a divorced parent's group.

It seems reasonable to assume that the well being of parents and that interparent conflict and parent-child relationship are mediating factors in children's adjustment. A family focused intervention program that helps parents deal with and assist their own children through difficult times is the most direct way of improving children's adjustment. With this in mind a control group study is planned for September, 1997. This study will be conducted in several schools in Greater Victoria and will include two treatment conditions: a *Caught in the Middle* program and a *Caught in the Middle* program with a concurrent, but separate group for parents. The parents who attend this group will be taught the skills contained in *Caught in the Middle* and will also receive assistance in ways they can help their children with the issues and concerns they face. Measures of anxiety and self-esteem will be included.

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Meeting the Needs of Female Physical Education Students in High School Physical Education

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The design of a collaborative research project that has as its focus the development of an alternative Physical Education 11 curriculum is described. This curriculum is designed to address the needs, abilities, and interests of adolescent females.

Introduction

The general population is becoming increasingly aware of the positive links between physical activity and health. However, this knowledge is not reflected in the physical activity participation rates of adolescent females. There is a well-documented systematic decline in young women's participation in physical activity during adolescence (Campbell, 1988; *Canadian Fitness and Lifestyle Research Institute* - CFLRI, 1996). Between the ages of 11 and 15, the percentage of girls and young women who exercise vigorously, out of school, drops from 27% to 12% (Edwards, 1995). Differences between female and male physical activity participation become pronounced among 13-17 year olds (CFLRI, 1996). On average, adolescent females spend 40% less time each week on physical activity than adolescent males, and their participation rates in vigorous physical activities are generally lower (CFLRI, 1996). This corresponds to a reduction in physical fitness and general health of adolescent females, particularly those at the level of senior high school. High school physical education programs have not escaped this low rate of participation. In British Columbia, only five to eight percent of female students choose to enroll in Physical Education during their high school years. The reasons for the low enrollment are complex. However, the fact that activity preferences differ markedly as a function of sex and age (CFLRI, 1996) may indicate that opportunities provided within traditional school programs may not be attractive to, or motivating for, young female students. The purpose of this paper is to discuss the design of a research project that will culminate in the development of a Physical Education 11 course which meets the needs, abilities and interests of adolescent females.

Physical Education 11 and 12 Integrated Resource Package

The B.C. Ministry of Education, Skills and Training has recently published a Review Document of the *Physical Education 11 and 12 Integrated Resource Package* - IRP (1996). This document follows the publication of Physical Education IRPs for grades K-7 and 8-10, which were implemented as of the '96 - '97 school year. The stated aim of the entire K-12 physical education curriculum is to "enable all students to enhance their quality of life through active living" (*Review Document*, 1996, p.5). The Physical Education 11 and 12 curriculum is designed to build on the kindergarten to grade 10 program toward achievement of this aim. The following key characteristics of Physical Education 11 and 12 have been identified in the Review Document:

- Foster positive attitudes toward lifelong physical activity.
- Foster active participation and enjoyment within the school and the community.
- Promote the development of a personal functional level of competence in physical activities.
- Promote problem-solving skills.
- Involve students with a variety of abilities and interests.
- Develop communication and leadership skills.
- Develop personal and career-planning skills.

It is within the context of both the aim of Physical Education and the specific characteristics of PE 11 and 12 that the needs, abilities, and interests of female students should be explicitly addressed. That is the goal of this project.

Background of the Project

The content and structure of this project is grounded in two related areas of research. First, the potential benefits that regular participation in physical activity may provide, as well as the barriers adolescent females encounter in the pursuit of these benefits is examined. Second, the process of curriculum development, specifically the involvement of teachers and students is utilized. Brief summaries of the major focus in these areas is provided in the following sections.

Adolescent Female Participation in Physical Activity: Benefits and Barriers

Regular physical activity is associated with a variety of positive physical, psychological, and social health outcomes. In particular, the benefits for active females include physical fitness, improved health habits, less smoking or not at all, improved physical skill development, and increased self-esteem

(Campbell, 1988). However, we know that adolescent females appear to be especially susceptible to inactivity. Results from studies have shown that more females than males are unfit; susceptible to eating disorders; obese; smoking by age 15; and experience low self-esteem (Stephens & Campbell, 1990).

Adolescent females face some significant barriers that limit their potential to experience the benefits of a physically active lifestyle. Therefore, any possible reduction of these barriers is a significant issue for investigation. Females generally have fewer opportunities and less encouragement to be physically active (Dahlgren, 1988). A notable barrier is the perpetuation of stereotypic beliefs that certain physical activities are more appropriately "male" or "female" (CFLRI, 1996). These beliefs contribute to a significant gender disparity in the opportunity for participation in physical activity and seem to have implications for the physical education curriculum where there is a high emphasis on stereotypic "male" activities. From a more positive perspective, school-based interventions for youth have been shown to be particularly effective at modifying adolescent behaviours (Campbell, 1994; U.S. Surgeon General, 1996). As most adolescent females are in school, a type of intervention program has tremendous potential to successfully address the removal of some of the barriers and as a result increase the physical activity levels of this population.

Teacher and Student Input in Curriculum Development

This project involves the design and implementation of a school-based program developed through active participation of the main stake-holders, namely, teachers and students. Involvement of teachers, at all stages of curriculum development, is viewed as a crucial factor for increasing the potential success of new curricular initiatives (Fullen & Stiegelbauer, 1991). This factor exemplifies the idea that teachers bring a knowledge of and appreciation for the day-to-day relevance and practicalities of their subject. In short, a curriculum written "by teachers for teachers" will be more likely to succeed because it addresses the most common criticisms teachers make of new curricular initiatives, namely, relevance and practicality (Fullan & Stiegelbauer, 1991).

The British Columbia Ministry of Education, Skills and Training has fully embraced the notion of teacher involvement in curriculum development. Teachers have taken lead roles in the development of new curriculum guides for a variety of subjects, including physical education. This project extends this role of involvement, by affording a group of teachers the opportunity to focus on and address the particular issue of meeting needs of female students as part of PE 11 and 12.

To date, involvement of students in curriculum development in physical education has primarily taken the form of participation in needs assessments and achievement tests. Typically the information that was collected has been used to judge the effectiveness of current programs rather than to directly influence course content and delivery. Fullan and Stiegelbauer (1991) emphasize the potential positive impact of involving students in a more meaningful role in curricular change. They state the following:

> Effective educational change and effective education overlap in significant ways. Involving students in a consideration of the meaning and purpose of specific changes and in new forms of day-to-day learning directly addresses the knowledge, skills, and behaviours necessary for all students to become engaged in their own learning. (p.190)

If the PE 11 curriculum is to meet the needs of adolescent females it is important to solicit input directly from them. This project is designed to allow students to have a direct involvement in curriculum development.

Project Overview

The project includes three distinct phases of development. *Phase I* involved the design and implementation of focus group discussions for teachers (N=10) and female high school students (N=50) from local secondary schools. The purpose of these focus group discussions was to gather information about the physical activity of adolescent females including preferences, barriers toward participation, and knowledge of the contribution of physical activity to health. Student participants were assigned to one of three focus groups.

Focus Group 1 included two sub-groups of female students (N=26) currently enrolled in PE 10 and contemplating their decision to enroll in PE 11 next year. *Focus group 2* included female students (N=12) who were currently enrolled in or had recently completed PE 11. *Focus group 3* was comprised of female students (N=12) who had chosen not to enroll in PE 11. Student participants in all focus groups were identified by their physical education teacher and represented a variety of previous experience, levels of interest, and achievement in physical education. Ten physical education teachers from local junior secondary, senior secondary, and combined junior/senior secondary schools participated in the teacher focus group discussions.

A structured focus group interview was used to collect data. The project researchers acted as facilitators for focus group discussions that were recorded on tape. Undergraduate and graduate student volunteers from the School of

Physical Education participated as field note recorders for the groups. Transcriptions of tapes and field notes have recently been completed. These transcripts have been returned to focus group participants for verification. Following verification, the transcripts will be analyzed for content and theme using the NUD.IST qualitative software, a code-based theory builder (Weitzman and Miles, 1995).

An initial examination of the transcripts has revealed some interesting insights and promising possibilities for improving the dismal enrollment status of female students in PE 11 and 12. From the perspective of content, the suggestions provided by both the student and teacher focus groups to "make PE more inviting for female students" give PE 11 a decidedly different "look" than many of the existing physical education programs. Four suggested content features appear to be consistent across all focus groups, including a focus on personal fitness activities (e.g. aerobics, weight training, self defense); physical activity certification opportunities (e.g. fitness leadership, rock climbing, national coaching levels); outdoor recreation activities (e.g. hiking, canoeing etc.); and opportunities to participate in activities formerly not available to females (e.g. wrestling, rugby). Several features including flexible scheduling, student choice of activities and course promotion are also consistent across all focus groups. A notable suggestion mentioned by all student focus groups highlighted the need for improvement of the physical education experience in grades 8-10 as a major factor for increasing enrollment in the senior grades.

Phase II will involve the organization of a symposium for local physical education teachers. The purpose of this symposium will be two-fold. First, it is intended to share the results of the focus group discussions which include suggestions for alternative curriculum content and organization associated with possible higher enrollment of adolescent females in physical education (e.g. personal fitness activities, certification programs, outdoor recreation possibilities, and access to non-traditional activities). Secondly, it is planned to work with interested teachers to begin the process of developing innovative curricula including these alternatives. In order to respond to the diverse school situations, it is anticipated that a variety of different program designs will emerge during this planning process.

Phase III will involve the implementation of several pilot PE 11 program alternatives (developed in Phase II) designed to meet the identified needs, expectations and interests of female students. This phase of the project will involve teachers and students in selected schools in several southern Vancouver Island school districts . A group of schools offering the traditional PE 11 program to female students and a group of schools offering the needs-designed programs to female students will be studied in a test/re-test experi-

mental design. Enrollment rate and health-related fitness will be compared between the groups. A questionnaire will be used to assess attitudes towards physical activity and health risk behavior such as smoking and poor nutritional habits. Results of the tests and questionnaire responses will be analyzed for differences between schools participating in the pilot programs and those continuing with the traditional program.

Summary

Promotion of lifelong active living is the ascribed aim for physical education programs in British Columbia schools. However, there is considerable evidence that current programs do not address the needs of adolescent females. This project will address this issue by involving those directly responsible for providing the opportunities (teachers) and those for whom the programs are intended (students). The research results and the curriculum that is developed will have implications for the development of effective, motivational, interesting programs to enhance and promote lifelong physical activity and health in young Canadian females.

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Influence of Aerobic Fitness on High Intensity Anaerobic Performance in Females

Catherine A. Gaul and David Docherty

Aerobic fitness is commonly implicated as an influencing factor in the ability to perform repeated high intensity anaerobic activities, despite the limited and equivocal research supporting this association. Information regarding the relationship between anaerobic performance and aerobic fitness is discussed, with a particular focus on female subjects.

Introduction

The increased participation of young women in physical activity and sport has led to a need for scientifically based information regarding the development of optimal exercise programs to improve performance. Many recreational and competitive activities that young women are now participating in demand repeated high intensity short duration efforts. These activities have a high anaerobic component as they require repeated short duration high intensity effort. It is common practice among coaches and trainers to include a large aerobic component to training for activities requiring high anaerobic abilities. It has been hypothesized that high aerobic fitness levels facilitate the recovery from intermittent intense, short duration work. However, the efficacy of such training has not been well demonstrated. This has led to the question of just how much aerobic exercise should be included in training programs intended to improve the ability to perform repeated high intensity short duration efforts. Understanding the influence aerobic fitness has on anaerobic performance should help those interested in improving fitness for competitive as well as recreational level performance in high intensity activities.

The few studies that have been conducted on the effect of aerobic fitness on intermittent, high intensity exercise are equivocal and have used exercise protocols that do not reflect the time-motion and physiological demands of most sports. Given the amount of time devoted to the training and maintenance of aerobic fitness, it is important to define and clarify the relationship between anaerobic, intermittent performance and aerobic fitness, particularly

for team sports such as field hockey, ice hockey, basketball, soccer and rugby.

Most research in the area of exercise physiology has traditionally been limited to male subjects, assuming that females will respond in a similar manner. The purpose of this paper is to describe the current understanding regarding the influence of aerobic fitness on the ability to perform intermittent high intensity anaerobic exercise, particularly as it relates to active females and to discuss some of the findings from recent related research conducted in our laboratory.

Anaerobic Energy Production and Fatigue

Many sports require repeated high levels of effort for short periods of time that place considerable demands on stored energy in the form of adenosine triphosphate [ATP] and creatine phosphate [CP], and energy produced through the metabolic processes of anaerobic glycolysis. CP, with its single high energy phosphagen, provides skeletal muscle with an immediate, easily accessible energy source. However, it is essentially depleted within ten seconds following the onset of high intensity exercise (Jones, Heigenhauser, Kukis, Matso, Sutton & Toews, 1985). As this depletion occurs, there is an increasing reliance on anaerobic glycolysis for production of ATP which quickly leads to the formation of lactic acid (Jacobs, Tesch, Bar-Or, Karlsson & Dotan, 1983) and a concomitant decrease in muscle pH. The increased lactate and hydrogen ions, resulting from the dissociation of lactic acid formed during glycolysis, are associated with muscular fatigue (Green, 1987). Both muscle and blood lactate concentrations are significantly elevated after as little as six to ten seconds of maximal intensity work (Boobis, Williams, & Wooten, 1982: Jacobs, et al., 1983) suggesting that anaerobic glycolysis is an important source of ATP resynthesis in short duration exercise. As the depletion of CP and the accumulation of lactate are limiting factors in high intensity muscular work, the resynthesis of ATP and CP, and the removal of lactate and hydrogen ions from muscle during recovery should facilitate subsequent short duration, maximal efforts.

Energy Demands of Sport

Time-motion analysis and limited physiological data on team sports, such as soccer, rugby and hockey (Ekblom, 1986; Docherty, Neary, & Wenger, 1988; Mayhew & Wenger, 1985), suggest that they involve considerable anaerobic energy production. The short duration of specific efforts at high intensity (less than 10 seconds) typical of these sports combined with reported post game blood lactates as high as 12 $mmol \cdot L^{-1}$ provide evidence that anaerobic

metabolism is an important source of energy production. To maintain the intensity of performance throughout such events, it is essential that exercising muscle return to a state close to homeostatic pH and the resynthesis of stored ATP and CP occur as rapidly as possible (Sahlin, Edstrom & Sjoholm, 1983). CP is considered to be almost completely replenished within minutes of recovery following high intensity exercise (McCartney, Spriet, Heigenhauser, Kowalchuk, Sutton, & Jones, 1986). The restoration of muscle pH to a homeostatic state takes longer and may not be accomplished during the game due to limited recovery periods.

Anaerobic Performance, Recovery and Aerobic Fitness

Theory: Enhancing the physiological recovery process is a training objective of most coaches and athletes engaged in sports that demand intermittent high intensity performance. Many varied physiological parameters have been used to assess metabolic recovery from high intensity exercise including aerobic power, heart rate, muscle and blood lactate, as well as inorganic phosphate to CP ratios (Bell, Snydmiller, Davies & Quinney, 1997; Petersen & Cooke, 1994). Aerobic endurance training has been associated with improved recovery from both submaximal and maximal exercise (Hagberg, Mullin & Nagle, 1980; Kuno, Akisada & Mitsumori, 1992). These associations have led to the implication that aerobic fitness may have an important role in the metabolic recovery from repeated high intensity, intermittent exercise. However, data from research related to this relationship have resulted in equivocal findings making it difficult to interpret whether or not a high aerobic fitness will have a beneficial effect on rapid recovery in order for an individual to sustain repeated, high intensity activities.

Theoretically, a high level of aerobic fitness should enhance recovery from all forms of metabolic activity (Rhodes & Twist, 1990). The intramuscular adaptations to aerobic training should aid in the resynthesis of ATP and CP and the removal and buffering of lactate and hydrogen ions. Lactate is oxidized to pyruvate which subsequently is processed through the Kreb cycle (Mazzeo, Brooks, Schoeller, & Budinger, 1986). Since hydrogen ions are consumed on an equimolar basis with lactate, the process provides an important mechanism for restoration of homeostatic pH. Glycolytic (Apple & Rogers, 1986) and oxidative (Gollnick, Armstrong, Saubert, Piehl, & Saltin, 1972) enzyme activities, and mitochondrial content (Gollnick & King, 1969) are all enhanced through endurance training. In addition, the aerobic training-induced increase in capillary density (Tesch & Wright, 1983) should facilitate diffusion of muscle lactate to blood. Restoration of CP may also be helped by greater availability of oxygen (Sahlin, Hams, & Hultman, 1979). Further, improved buffering capacity, resulting from increased blood volume

associated with endurance training should enhance recovery (Saltin, Blomquist, Mitchell, Johnson, Widenthal, & Chapman, 1968). Nevertheless, despite the physiological rationale, the direct effect of aerobic training on recovery from intermittent high intensity short duration exercise has not been well documented for any population.

Research Findings: Schreiner (1988), studying fit adult females, and Sleivert, (1991) working with male varsity athletes, examined the metabolic changes in skeletal muscle that occurred in athletes with high and low maximal aerobic power levels after intense intermittent exercise. They observed no difference between the groups in lactate removal (Schreiner, 1988), pH, or Pi/CP ratio (Sleivert, 1991) during recovery. Petersen & Cooke (1994) used phosphorous magnetic resonance spectroscopy to investigate the influence of maximal aerobic power on recovery from high intensity exercise in men. They concluded that maximal aerobic power is a poor predictor of the rate of recovery. However, this conclusion was based on a single bout of exercise and cannot be extended to repeated high intensity performances.

Gaiga and Docherty (1995) were able to demonstrate significant performance improvements in repeated maximal intensity 30 second Wingate cycling tests following aerobic interval training in active males. However, the interval aspect of the aerobic training protocol made it difficult to differentiate the potential contributions of the training related aerobic and anaerobic adaptations. In addition, the four 30 second Wingate tests with four minute recovery periods did not simulate the time-motion characteristics of most team sports. Bell, Snydmiller, Davies and Quinney (1997) reported physiological indices commonly measured in aerobic fitness assessments could not be used to indicate the ability to recover from intermittent high intensity exercise in male, endurance trained cyclists.

In our most recent research, anaerobic testing protocols that reflect the time-motion and physiological demands of team sports such as soccer, rugby and field hockey were used to evaluate the influence aerobic fitness has on this type of performance. On separate occasions, 36 active female subjects performed two different sets of anaerobic performances: A) ten maximal intensity repeats of six seconds duration, with 30 seconds of passive recovery on a cycle (Monarch) ergometer, and B) six maximal intensity tests of 15 seconds, separated by 90 seconds of active recovery. The different recovery protocols were intended to have specific measurable effects on restoration of CP and removal of muscle lactate. In addition, maximal aerobic power of each subject was assessed directly through the use of a progressive cycling protocol. Relationships between maximal aerobic power and anaerobic recovery-related variables including fatigue index, drop in peak power and drop in total work were evaluated. Only weak relationships were found between maximal aero-

bic power and any of the anaerobic variables, providing little support for aerobic fitness having a beneficial influence on recovery from repeated anaerobic work or on the performance of intermittent anaerobic exercise.

To date studies examining these relationships have only included aerobic variables reflecting central cardiovascular adaptations to training, such as heart rate and oxygen consumption. It is possible that peripheral adaptations to aerobic training including enhanced skeletal muscle metabolism and oxygen extraction play a much greater role in recovery processes than do central factors. Since the development of fatigue during repeated high intensity anaerobic exercise resides at the level of the muscle, it is possible that a relationship exists between peripheral aerobic variables and anaerobic performance. In addition, most of the research in this area has involved cross-sectional studies of male subject populations with relatively homogenous fitness levels. Such research designs may limit the ability to evaluate the physiological relationships between aerobic fitness and anaerobic performance of repeated efforts. Furthermore, a critical level of aerobic fitness may be required to facilitate recovery from repeated high intensity anaerobic work. Research regarding this critical or 'threshold' theory has yet to be conducted. Until these possible associations have been evaluated our understanding of aerobic influences on anaerobic performance will remain incomplete.

Significance of Research

As a greater percentage of the population is becoming more physically active, there is an increasing need to provide effective exercise programs. Many individuals are being attracted to team sports such as soccer, basketball, rugby and hockey (field and ice), both at the recreational and competitive level. In order to perform such activities safely, it is essential that the individual be properly prepared physically. Therefore, appropriate exercise programs must be formulated to ensure the risk of injury, both musculoskeletal as well as cardiovascular, during participation in exercise is decreased. In order to develop such programs there is a need to evaluate the relationships that exist between aerobic and anaerobic metabolic processes. Understanding the influence of aerobic fitness on anaerobic performance, and recovery processes, will provide valuable information regarding the type of training an individual should follow in order to avoid injury and effectively improve performance in their activity of choice. As there is a paucity of information regarding fitness and performance of young women, studies regarding the aerobic relationship with anaerobic performance and recovery must include female subjects in order to enhance the knowledge presently available.

Summary

Currently little research evidence exists to support the need for developing aerobic fitness for athletes engaged in sports that demand intermittent, high intensity, short duration efforts. While theoretically, it may be argued that a more powerful aerobic system can improve the ability to recover from repeated bouts of high intensity activity by enhancing the resynthesis of ATP and CP as well as the removal of lactate, such arguments are not supported in the scientific literature.

Aerobic training is considered by many to be an essential component of any training program. However, further research is necessary to elucidate the role aerobic metabolism has on anaerobic performance. The results of this line of inquiry can provide justification for the inclusion of training programs specifically designed to improve aerobic fitness for those interested in being able to perform repeated high intensity exercise. The inclusion of several different, yet related, measures of aerobic fitness in this type of research may assist in identifying the specific measures that make the greatest contribution to intermittent, anaerobic performance. The information provided by such investigations will assist coaches and athletes to focus on the most important aspects of appropriate, specific training programs — an important consideration for those involved in team sports who often have limited time to address all the demands of their sport.

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Implementation of the K-7 Personal Planning Program

Anne Marshall

An ongoing project aimed at developing resources to support teachers in the implementation of the new K to 7 Personal Planning curriculum is desired. Preliminary results indicate adequate availability of resources, but a need for more organization and school-wide planning for delivery.

Elementary schools throughout British Columbia began implementation of the new K-7 Personal Planning (PP) curriculum in September 1996. Few resources were available beyond the basic outlines provided in the 1995 Integrated Resource Package (IRP) to help teachers plan exactly how they would present this new curriculum. to their classes. Common questions asked by teachers have been, "Why is it important to teach this?" and "How do I teach it in my classroom?" Teachers are seeking an understanding of the relevance of this new curriculum to today's world, a coherent delivery plan for implementation, and resource support for their lessons.

The formation of "cross-school work teams" in School District #61, Victoria, over the last four years,has proven to be successful in generating a number of projects to help teachers respond to the many new challenges and initiatives in education. One of these projects was the development of a *Curriculum Delivery Guide* (Charlton, Hall & Future Design Team, 1995-96) for the implementation of Career and Personal Planning (CAPP) in grades 8 to 12.

An ongoing project aimed at developing resources to support teachers in the implementation of Personal Planning at the K-7 level is described in this paper. This project involves a partnership between the University of Victoria and the Victoria School District. Beyond the author, the project team includes two School Services Coordinators, an elementary teacher/administrator, and a graduate student research assistant who is also an elementary teacher. The funding support provided by the University of Victoria Office of Educational Renewal, was matched by the school district.

The team is working on four resource documents for teachers that will be available in the fall of 1997. One resource is a conceptual framework document, or an overview for implementation. This paper will present the ration-

ale, philosophy, structure and organization, or the "why" of the Personal Planning program. The second resource is a Delivery Guide, similar to the one which already exists for CAPP grades 8 to 12. Supplementing this new K to 7 Delivery Guide will be two further resources for implementation with a focus on "the how". One will be a list of recommended PP resources that are currently available in schools, and the other will be a list of teachers, parents, and other community members who will be able to act as consultants and mentors in the implementation of the PP program.

Theoretical Framework

Educators have long recognized that emotional and social growth are as important to the development of healthy, active and educated citizens as academic and physical growth. Consistent with this belief, many changes and recommendations have been incorporated into curriculum documents during the last decade in British Columbia. The current Kindergarten to Grade 12 Education Plan also supports the commitment to the development of well-rounded, balanced individuals. The Personal Planning K to 7 and Career and Personal Planning 8 to 12 curricula are intended to help students become thoughtful, caring individuals who plan, review, make informed choices, and take responsibility for their lifelong personal and career development.

This type of holistic approach is reflected in theories of personal and career development such as Kegan's Constructive Development (1982) and Super's Life-Span Life-Space Approach (1990), as well as in a number of constructivist approaches (Carlsen, 1988; Mahoney, 1991; Peavy, 1993). These theories and approaches all emphasize the importance of experiential learning and the role of meaning in people's lives, notions that are critical components of the PP and CAPP curricula. The challenge for educators is to translate these concepts into specific teaching activities to complement and supplement the core curriculum areas such as mathematics and language arts.

The Personal Planning Curriculum

The overall purpose of the Personal Planning curriculum is on students' personal development, and on how their schooling and other activites relate to their future plans. "The aim of PP K to 7 is to enable students to become thoughtful, caring individuals who plan and reflect, make informed choices, and take responsibility for their own personal and career development" (BC Ministry of Education, 1995, p. 2). The aim and the organization are the same for the Career and Personal Planning IRP, grades 8 to 12.

The PP curriculum consists of three interrelated elements or "organizers". Each one includes several important sub-organizers.

- The Planning Process helps students develop personal, career and educational goals and work towards realizing them. It includes:
  - collecting information
  - making plans and decisions
  - implementing and monitoring

- Personal Development helps students acquire the knowledge, attitudes and skills needed to lead healthy and productive lives. It includes:
  - healthy living
  - mental well-being
  - family life education
  - child abuse prevention
  - substance abuse prevention
  - safety and injury prevention

- Career Development helps students integrate personal, educational, work, and community learning experiences to prepare for future career choices. It includes:
  - career awareness
  - career exploration
  - career preparation

Attached to each sub-organizer are a number of specific "Learning Outcomes." The original 1995 Personal Planning IRP had over 250 Learning Outcomes. This number will be reduced in an updated version of the IRP.

The Implementation Project

In the late fall of 1996, a survey in the Victoria District identified a number of schools that were interested in participating in the project. Response data from this survey was used to choose six schools. Criteria for inclusion included: identification of PP implementation in 1996-97 School Initiated Plans; initial steps taken toward PP implementation strategies; commitment from school administration and/or teachers to join the PP Advisory Committee; and previous participation in programs and projects related to PP goals, such as the *BC Life Skills Program* (1996) or *The Real Game* (1995).

Semi-structured interview guides were developed. There were three versions, one for administrators and teachers, one for students and one for parents. The interview questions were designed to assess the following areas: awareness

of and support for the PP Program; application of lessons to IRP learning outcomes; content relevancy; delivery issues; participation and involvement; methods of evaluation and reporting; and general comments about Personal Planning.

The first phase of this project involves the upper elementary grades, mostly grades six and seven. At each participating school, the administrators, all of the grade 6 and 7 teachers, and a sample of students as well as parents were invited to participate. Data from the interviews is being used to develop the resource documents: the Implementation Overview; the Delivery Guide; the resource list; and the consultant/mentor list.

Preliminary Interview Results

At this time, interviews have been completed with most administrators and grade 6/7 teachers, and a small number of parents and students. Several themes are emerging from their responses.

- Personal Planning activities are not a major problem. There are many excellent learning resources, community speakers, books, and videos available. Cost and accessibility are issues. Some materials are expensive and this necessitates sharing. Another issue that surfaced is a lack of Canadian content.

- Responses from teachers indicated that they are generally more comfortable with the Planning Process and Career Development areas than with Personal Development, particularly the family life and healthy living components. Some teachers resolve this dilemma by having "experts" such as counsellors or guest speakers cover these topics. Others use videos or worksheets from already published resources covering topics such as family values or substance abuse.

- The extent of PP implementation is variable. Some schools are doing quite a lot, while others are doing as little as possible. Those schools which have been part of early initiatives within the district and/or which have keen resource people and as a result possess detailed or thorough implementation plans. Schools that have tied the significant outcomes to PP are the most successful with respect to program development and the participation of staff and students.

- The overall philosophy and intent of the program does not seem to be well understood by teachers and parents. Teachers have been concentrating on techniques or specific lessons, rather than on an integrated approach or a "school plan" for all grades.

- Some of the programs, as is the case for parts of the career programs, are too extensive for one grade level. Some schools, for example, are delivering *The Real Game* (a life-career simulation) over two years, grades 6 and 7. This necessitates sharing and cooperative planning among teachers.

- Since informing parents is vital for acceptance and involvement, communication with parents needs to be improved. There exists a definite need for a district "sensitive issues" policy. It is currently being drafted.

- Assessment of the learning outcomes varies greatly from school to school. Some teachers assign grades to work in PP, others use pass/fail. Teachers are unsure how to assess some assignments, such as journals and plans for the future. More assistance and in-service activities are needed in this critical area.

Future Steps and Potential Applications

The interviewing and information gathering process will continue with the senior grades and will subsequently include the intermediate and primary grades. The outcome of this project will be to provide teachers with four key resource components:

- a description of the conceptual framework forming the basis of the *K to 7 Personal Planning Program*,
- a curriculum delivery guide to support the implementation of the program,
- a list of resources already available in schools that meet some of the requirements of the program, and
- a list of teachers and community people available to act as consultants and mentors in specific topic areas.

These components will form the base of a more comprehensive resource that will include curriculum organizers, specific lesson plans, assessment strategies, reporting alternatives, and a directory of resource people. This constitutes Phase II of this project, and it is hoped that this will be a cooperative venture with the Ministry of Education, Skills and Training. The resultant comprehensive resource is intended to be used in workshops and other in-

service activities for teachers and administrators.

These resources will be of interest to elementary schools, school boards, independent educational organizations, parent advisory committees, and community groups in the province of British Columbia. Much of the documents would also be relevant for similar interest groups in other Canadian provinces. The results from the interviews and the resource documents will also be appropriate for inclusion in college and university courses, and in programs that deal with teacher preparation, personal growth and development, and career development.

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Yet Sun Heywa: Developing A First Nations Art Website

Bill Zuk and Robert Dalton

The development of an interactive computer teaching project, a multicultural learning resource for Internet and CD ROM use, that incorporates a contemporary collection of silkscreen prints from First Nations cultures of the Northwest Coast of British Columbia is described.

"Yet sun heywa" means "we are going somewhere" in the Coast Salish language. This title has been chosen to honour the people who have lived in the lower Vancouver Island region for thousands of years because this is where this project began. The phrase also describes our journey into the Pacific Northwest cultures of British Columbia. A welcoming figure (see Figure 1) inviting everyone to share in the multicultural experience is used to introduce this paper and the stories presented in the website project. This is in keeping with the custom of First Nations people to share stories with others as a way of preserving their strong oral and visual art traditions.

Figure 1 Welcoming Figure

Origins and Aims

The University of Victoria Maltwood Museum and Art Gallery recently acquired a collection of 2 000 limited edition silkscreen (serigraph) prints that document the development of the aboriginal print medium from the 1950's to the present. Master artists from all six major linguistic and cultural First Nations groups in British Columbia's coastal areas are included: Tlingit, Haida, Tsimshian, Kwakiutl, Nuuchah-nulth, and Salish. The collection is rich in contextual material and contains artist biographies and statements, historical photographs, as well as video clips and interviews with artists.

The acquisition of an important collection of this sort led the Maltwood's Director, Martin Segger, to seek ways to make this resource accessible. Space limitations in the Museum mean that only a small number of prints can be on public display at any time, the rest of the collection must be kept in the vaults. Segger expressed an interest in making more of the collection available to a wider audience than those who would normally visit the Museum. Simply exhibiting the artwork is one way

project; and two were art students with a background in design and illustration. It was hoped that while working with us, the students would be able to make a significant contribution and learn a great deal about researching ideas, working in collaborative situations, and producing multimedia electronic learning resources.

Theoretical Perspectives

This project is based on theories of cultural maintenance in changing societies, position statements about multicultural art education, and research methods concerning ethnographic data collection. The heritage of every society includes a considerable body of beliefs, assumptions, and concepts that define the nature of the world in which its members live, and through which they perceive events that occur around them (Harris, 1963). Traditional Northwest Coast artworks use certain culturally prescribed colour schemes such as red and black, organizational principles such as bilateral symmetry, and shapes such as ovoids. These artworks strictly adhere to clan symbols as they tell of the original beliefs and values of a people. Among the indigenous cultures of the Pacific Northwest Coast, those values would include: respect for elements in Nature and caring towards the Earth and its creatures.

Since the goal of this project was to look at tradition and innovation, it was necessary to define innovation. Tradition in indigenous art may be defined as form and content that remain unchanged over time, but innovation is more difficult to defiine. MacNair, Hoover, and Neary (1987) describe the indigenous innovator as someone who is less restricted in their use of materials and their exploration of subject and form. This may involve combining or substituting more than one material or process, or abbreviating ideas while still applying the intellectual control that characterizes master work from a previous era. Innovation develops through experimentation to an expanded repertoire of ideas. As it departs from well established rules, it seems less predictable. Zuk and Bergland (1992) identify a number of processes for freely altering images to create new, innovative ones. These processes are referred to as image development strategies and include such operations as: elaboration, simplification, distortion, and juxtaposition. These alterations to images enable artists to create artworks that not only "look" new, but also introduce new ideas.

Art objects can provide a valuable starting point for multicultural art education (Stuhr, Petrovich-Mwaniki, and Wasson, 1992). Using the art object as the focus of discussion, students can be given the opportunity to investigate the artist and culture that created it. As they begin to understand the culture, they are able to make comparisons with their own. Ideal multicultural learning expands cultural knowledge, affirms one's own culture, fosters respect for others, and discovers connections.

of exposing viewers to the formal properties of the work, its design qualities, colour, and composition. However, without the benefit of further explanation, much of the meaning and significance of the prints is not revealed. In order to contextualize the ideas of the collection and make it more accessible, Segger invited us as art educators, to participate in a project that involved developing ideas for universal access on the Internet.

Educational institutions and public schools are becoming increasingly computerized, and they are also involved in using multimedia technologies as a way of making their programs current and more effective. The project aims to combine various forms of visual, sound, and text information through the development of a website and an interactive disk technology system (CD ROM). This project has the potential to make an important contribution to modernizing the delivery of learning. The use of technology that combines images, sound, and text can provide students with opportunities for engaging in interactive learning. As they handle complex information, they can quickly move from one culture to another and analyze or make comparisons while adding depth to the way they conceptualize various new ideas. Many First Nations schools and programs are developing locally based curricula that feature programs of cultural studies that increasingly make use of electronic technologies to enhance the instructional process. This project can become part of this process. A website and CD ROM is the primary means of making available a highly useable form of electronic information to 16 000 public schools across Canada as well as institutions, galleries, and museums across North America and beyond.

A second objective of the project is to promote multicultural learning. Art is an important vehicle for exploring cultural ideas because it documents beliefs and customs. It also contributes to appreciation and respect because it represents some of the finest achievements of societies. An important and frequently overlooked aspect of multicultural education is the notion of change. Cultural aspects are often misrepresented by an emphasis on traditions without acknowledging evolution and adaptation to the challenges and opportunities of contemporary life. This project takes into account both tradition and innovation. It seeks to develop in students a deeper appreciation for the history and distinctiveness of cultures as well as how they change, adapt, and revitalize.

A third objective of the project includes the involvement of a group of students working as a team in the design and development of the program. Six people were hired for the project, some were undergraduate students at the University of Victoria and others were recent high school graduates about to enter post-secondary institutions. Expertise in a variety of important areas was represented: two First Nations students had insight into their cultures and were able to make contact with artists and elders willing to be interviewed; another two students were knowledgeable in computer programming and able to develop technological aspects of the

A Website Excerpt: The Work of Charles Elliott

An excerpt from the website is provided to illustrate how ideas are organized into the journey format. The example also indicates the personal manner of presenting ideas.

You are exploring the Coast Salish region. You fly high above the trees and over a swift flowing river. You decide to land and pass some time beside this beautiful river. While there, you encounter a man seated on a tree stump. He sees you and says, "Hello Raven, my name is Charles Elliott. I am of the Coast Salish people." He confides in you his anguish over the decline of Salish art in recent history. "It had to be awakened and nursed back to health. I'm happy to say I'm one of the people who has dedicated his life to this reawakening."

THE FROG LEGEND: Though very small and peaceful, the frog has an important role to play in Coast Salish myths and legends, even to this day. The frog is the one in the spring of the year who sings to announce the beginning of a new cycle. To the Coast Salish people, the voice of the frogs tells us all to put aside the things of winter such as winter dancing and potlatching in order to begin the new cycle of preparation for next winter's activities. The little frog, though small, has a very important job to do in the yearly cycle, equal in importance with the arrival of Centeki, the first salmon (which is the sockeye) or Pekelanew, the moon which turns the leaves white. The frog is honoured as the keeper of the sacred seasons and is often remembered in our legends and stories, appearing in our artworks, totems, and house posts.

Based on what you have just heard, answer the following question:

What governs the Coast Salish peoples' festivities?

–The tribe leader –Time –Nature

If you selected "the tribe leader" as your answer, add two days to your journey. Remember what the legend said about "singing."

If you selected "time" as your answer, add two days to your journey.

Time is a natural force of its own; some may argue that it does not control events.

If you selected "nature" as your answer, add only one day to your journey. The seasons are the forces of nature which trigger the singing of the frogs.

To congratulate you on your understanding of the frog legend, Charles Elliott presents you with a print, Salish Renewal. This print was produced for the naming potlatch of an adopted daughter of Nuu-chah-nulth and Salish parents. The singing of frogs indicates the Salish New Year. This image symbolizes the union of two cultures, hence the beginning of a new cycle of future harmony between cultures. The joined mouths of the male and female represent union and creation. The print also represents the revitalization of Salish culture. Charles Elliott explains that this print is an example of how contemporary ideas may be integrated with traditional

As part of this website project, students used ethnographic interviews to elicit information about the works from the artists who created them and from knowledgable elders in the community, familiar with the stories and artistic traditions of their cultures. The questions and interview procedures were developed using research practices recommended by Spradley (1979). These procedures enabled the students to gain information that was valid, and accorded the First Nations informants the respect that was their due. While the theorists may have much to say about what constitutes tradition and innovation, the questions posed by the students were framed in a way that invited the artists and elders to determine which aspects of the work were traditional and which were innovative.

Stages of the Project

Initially it was necessary to acquaint ourselves with the collection of prints and any additional information that could contribute to the background data about the artists and their cultures. It was judged to be impractical to create a website that contained all of the available 2 000 prints. The amount of data would be too overwhelming and due to time constraints, would make organization impossible. The challenge was to identify a representative selection for use in the website and CD ROM. Two criteria were applied in the selection: first, we considered it necessary to include each of the six cultures and representative examples of artwork created by artists from each culture; and second, we considered it advisable to choose works from artists who were acknowledged by their communities and by the wider circle of art gallery curators and museum personnel as being master artists with considerable skill and expertise in creating prints. On occasion, a chosen artist was unavailable for an interview, but we were satisfied that those who were asked to comment, were well qualified to speak about the art and culture. As a further step in becoming better acquainted with the cultures represented in the study, the student researchers undertook extensive reading. They also attended First Nations celebrations and performances, and videotaped, photographed, and audiotaped whenever they were given permission to do so.

As the data were collected, it became necessary to develop a structure and framework that would introduce the available information to participants in the website learning experience. The idea of a journey was chosen as a way of having visitors travel from one culture to another. Along the way, travelers are presented with a number of challenges that involve looking closely and attending to a variety of art forms, which often are based on myths and legends. Questions are asked that require application of what is being learned. The intent is to challenge users to look closely, listen carefully, and reflect on the way answers are formulated. Thoughtfully chosen correct responses hasten the completion of the journey.

Figure 2

Figure 3

Figure 4

BEST COPY AVAILABLE

Salish design elements. "Raven, here, is an example of how art may change with the times. This is innovation."

Being a curious raven, you must know more. You ask Mr. Elliott to describe traditional Salish design. He responds by saying a main element of Salish style is that we don't give it all away. It's a very subtle art. We keep some of it for ourselves because it can be very personal. The rest is for the eyes of others. Show that you understand what Charles Elliott has told you. Try to identify the Salish print from the three prints shown (see Figures 2, 3, and 4) before you read on.

Figure 2—*Poison and Man*
The first print is Poison Salmon and Man by Tim Paul. Salish design does not fill in all the spaces, it leaves room for the eye to continue the form on its own. If you chose this print, you must spend two days escaping the salmon. Please try again.

Figure 3—*Salish Renewal*
In the second print, notice how the lines around the eyes and mouth are discontinuous. They are crescent shapes which imply line rather than exactly representing line. It is the subtle style of the Salish which Charles Elliott fully employs. This is Salish Renewal. Your choice is correct. You spend one day admiring the print then continue on your journey.

Figure 4—*Swan*
The third print is Swan by Patrick Amos. Salish design includes discontinuous lines. You spend two days admiring the beauty of the swan. Please try again.

Initial Observations and Possible Extension

An evaluation of the program is currently underway. Informal assessments have been made by a variety of audiences including teachers in a Master of Education program at the University of Victoria and members of the First Nations community. Formal testing of the program will take place in Terrace, British Columbia, where First Nations artists and cultural teachers will be asked to assess the program. Administrators in schools with a significant population of Native students will also be interviewed. CD ROMs will be available at that time for those who are currently unable to access the program through internet. The intent is to assess the value of the program and its method of delivery. Finding out how adults and students respond to the information and whether or not they find the interactive computer technology challenging, involving, and enjoyable is also of interest. Criteria will include ease of accessing information, the degree of challenge and difficulty presented in each unit of activity, and the comprehensiveness of cultural informa-

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tion in each learning module. For any teachers and students who do not have access to computers, a text version will be made available.

The information that is collected should make it possible to determine whether changes and/or improvements are needed. A final step will involve the further production of CDs with cover designs that make use of images in the print collection. These will be distributed to schools, universities, and museums.

The production of the website and the CD are the first stage of a larger project that we hope will see the production of separate CDs for each of the six cultures, providing a more in-depth examination of the cultures and making greater use of the print collection. As well, it is hoped that the scope of the project will be extended to include the cultural counterparts of nations represented in this project: the Tlingit in Alaska as well as the Makah and Salish in Washington. An advisory group of educators, artists, First Nations representatives, and technicians has been assembled, and sources of funding are being explored to extend the present project.

Initial response to the website has been very favourable. Students involved in the research project have indicated that it has been a valuable learning experience for them. Through involvement in the project they have increased their own understanding and appreciation for the indigenous art of contemporary Northwest Coast Native printmakers in British Columbia. They learned from one another through cooperating as a team to share expertise, set goals, and take responsibility for meeting those goals in the production of a program about which they feel a certain pride. Audiences who have viewed the program have given favorable comments about the work. As the first stage nears completion, more formal evaluation will be conducted and reports will be made to the agencies funding this research. The response to these reports will prove critical in securing further funding to continue the work. The possibilities for greatly extending access to museum collections through interactive computer technology are promising, as are the prospects of involving students as part of a collaborative team of researchers in producing a multicultural curriculum. We have enjoyed the challenges and look ahead to what the promising future might hold.

"Yet Sun Heywa" can be found on the web, its URL is www.maltwood.uvic.ca

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Rediscovering Traditional Science in Multicultural Science Education

Gloria Snively and John Corsiglia

During the past two decades, working scientists have found that Traditional Ecological Knowledge (TEK) provides a wealth of information relating to bio-regions, home places, medicine, biopesticides, agriculture, navigation, astronomy, as well as engineering and political science. Since TEK encapsulates time-proven experimentation and problem solving related to sustaining both communities and resources, an argument is presented for its inclusion in school based science education programs to provide examples of multicultural science.

Long-resident cultures have, in the course of time, developed knowledge and wisdom strategies that have enabled them to sustain environment, resources, and populations over very long expanses of time. Acknowledging the contributions of multicultural science, especially that of long resident oral culture peoples, is a necessary first step in enabling students to recognize and learn from groups outside the dominant culture who have made important contributions in the fields of medicine, agriculture, ecology, habitat and resource management, and community-environment relationships. Multicultural science education, by its very nature, must begin with the exploration of local issues, environments, technologies, and methods for sustaining the environment; and proceed to national and global issues. In addition, it must provide an active learning environment that encourages questioning and decision making.

Educators, particularly specialists in multi-cultural and First Nations education have long called for the contributions of other cultures to be properly integrated into all subject areas (Leith & Sientz, 1984; Pepper & Henry, 1986; Whyte, 1986). New terms have become part of this new literature such as traditional ecological knowledge (TEK); multicultural environmental education (Running Grass, 1994); multicultural science education (Atwater, 1991, 1994; Hodson, 1993; Atwater & Riley, 1993; Stanley & Brickhouse, 1994); and multi-science education (Ogawa, 1995).

In an effort to support wider consideration of the lessons to be learned from indigenous peoples, the nature of traditional science, including aspects of this body of knowledge which are referred to as TEK and traditional wisdom are discussed. The essay is limited to dealing with only a few examples of long-resident oral peoples—the Indian, Inuit, and Metis of North America. Efforts to promote a broader multicultural view of science education will be reviewed, including what needs to be done to change teacher education programs and curriculum models in science education programs.

The Need for a Cultural Perspective Towards Science Education

Most Ministry of Education documents across Canada mandate that making science education more learner centered means taking into account *all* learners. Concern with enhancing self-image and feelings of self-worth, a key strategy in creating a climate of success in school, raises fundamental multicultural issues. Even a cursory glance at data relating educational attainment with ethnicity reveals that children of ethnic minorities (Maori children in New Zealand; First Nations children in North America; Aboriginal children in Australia; those of Afro-Caribbean descents in Britain; Afro-Americans; and Inuit and Metis in the United States and Canada), fail to achieve these expected goals (Eggleston, 1986). As a consequence they fail to achieve in secondary school and in post-secondary science (Atwater, 1986, 1994; Hodson, 1993).

To develop a truly multicultural perspective to education, the need that exists for this perspective in science education must be recognized. There is a tendency in western society for scientific ideas, research, and almost any statement that is presented in a scientific way to be accepted as true (Siram-Blatchford, 1990). As a consequence, school science can be misused by groups of people to promote their own interests. The case is well put by the School Science Curriculum Review (1985):

> Science or "pseudo science" has been used to justify racism and the oppression of minority groups at home and of conquered people abroad. Pupils should be aware of this misuse of science and at the same time be able to understand the basic sameness of the human race and the different ways in which groups have adapted to their environment.

According to Hodson (1993), an initial analysis of most science textbooks leads to the realization that the implicit message is that the only science is western science. The author identifies several causal factors. These include:

- science curriculum content is often exclusively western in orientation;
- many curriculum materials are covertly racist, just as many are still covertly sexist;
- teaching and learning methods are sometimes inappropriate to the cultural traditions of minorities; and
- the image of the scientist as the controller, manipulator, and exploiter of the environment is in conflict with the cultural values of some children.

These factors indicate that acceptance of a multi-cultural view of science education is not presently widespread in schools. A system of science education is described where students are expected to be passive, to adhere strictly to a western view of science, and to accept without question the information presented. Such techniques go against what is presently known about effective teaching. They discourage students from seeking to understand science concepts. Since the responsibility for developing culturally appropriate curricula has largely been left to social studies and multi-cultural teachers, the development of well researched programs and appropriate teaching and learning strategies for science teachers remains pressing.

Traditional Science

Traditional science interprets how the world works from particular cultural perspectives. Traditional science, or ethnoscience, has been described as "the study of systems of knowledge developed by a given culture to classify the objects, activities, and events of its universe" (Hardesty, 1977). The science of long-resident peoples differs considerably from group to group depending on the locale, and is knowledge built up through generations of living in close contact with the land. It includes remembered sensory information built upon repeated observation and inquiry, as well as more formal information that is usually transmitted orally in story form, which encapsulates abstract metaphorical principles (Bowers, 1993; Cruikshank, 1981, 1991; Nelson, 1983).

A fundamental principle taught by Aboriginal elders is that subject matter is to be examined and interpreted contextually. For example, identification and examination of a particular plant and its fruits, is almost incidental to stories and demonstrations that relate to its use as a food source, ceremonial uses, the complex preparation process, the traditional accounts of its use in purification rituals, or its kin affiliations (Christie, 1991). Such a social context is in marked contrast with Western science where "environmental" influences are considered confounding, and where most serious work is done in the labora-

tory. Traditional science tends to be holistic, viewing the world as an interconnected whole. Humans are not regarded as more important than nature. Thus, "Traditional science is moral, as opposed to supposedly value-free" (Berkes, 1993).

Traditional science, like western empiricism, is based upon observations and experiences. It addresses a wide range of topics (Corsiglia & Snively, 1995, p. 27):

- preparation and design of clothing, shelter, food, and tools;
- traditional medicine, counselling, and psychology;
- aboriginal classification systems of natural and social environments;
- aboriginal taxonomy within the plant and animal Kingdoms;
- traditional knowledge of plants and animals (uses, life cycles, migrations, inter-relationships);
- ecological knowledge of habitats, food sources, and the interrelationships between environments and life forms;
- traditional perspective on traditional harvesting;
- technology applied to hunting, fishing, root-digging, harvesting basket materials, and tanning hides;
- knowledge of weather, seasonal changes, lake, and river changes;
- knowledge of geology, volcanic activity, and glacial activities;
- knowledge of ocean currents, tides, distribution of organisms, and food relationships;
- knowledge of metallurgy, copper technology;
- wilderness survival, living off the land; and
- conceptions of preservation, conservation, and sustainable development.

Acceptance of the validity of insights related to the above topics by courts, government officials, scientists, and First Nations advocates indicates that TEK can provide useful, highly reliable, and cost-effective information about plant and animal species as well as relationships amongst species, habitats, and human-environment relationships (Berkes & Mackenzie, 1978; Andrews, 1988; Berkes, 1988, 1993; Inglis, 1993; Williams & Baines, 1993). The outcome of this abstracting of lessons or pieces of wisdom is an emphasis on results, not procedures and authorship.

Important traditional science observations may be encoded in highly compressed metaphors that can be decoded in relation to specific circumstances upon appropriate reflection or contemplation. The ubiquitous "trickster" stories have been described as sufficient to guide a person who has become lost in finding all the necessities required to sustain life. Edwin Scurvy once ex-

plained to Cruikshank (1991):

> If I ever get stuck in the bush, I wouldn't have any trouble. I'd just remember what Asuya did when he was traveling around and I'd know what to do. You follow that story and it tells you everything you need to know. That's how they used to teach us when we were kids. (p.13)

Since traditional people tend to spend generations learning about life in one place, traditional science often may not resemble the more mobile and dramatic western science that was developed in intimate association with the rise of western global expansionism. Experimentation and innovation may take place at a more measured pace than in western science. In her observations of Athapaskan and Tlingit languages in the Yukon and Northwest Territories, Cruikshank (1991) notes:

> Observations are made over a lifetime. Hunting peoples carefully study animal and plant life cycles, topography, seasonal changes and mineral resources. Elders speaking about landscape, climate and ecological changes are usually basing their observations on a lifetime of experience. In contrast, because much scientific research in the north is university-based, it is organized around short summer field seasons. The long-term observations included in oral accounts provide important perspectives on the questions scientists are studying. (p.18)

Among the Nis<u>G</u>a'a of northern British Columbia, for example, one rarely responds to a request for information or opinion quickly. It is more respectful to consider such requests for a number of days before making a carefully considered response. Mistakes cannot be tolerated when footsteps take one where swift water rushes beneath river ice. Trial and error may not be cost-effective in a stable community where one must live with correct or incorrect solutions. Where a community is resident and stable, solutions to problems can be preserved, refined, and re-applied over time. When circumstances dramatically change, communities move, or individuals are lost or under pressure, the rate of inquiry must be accelerated.

Contributions of Traditional Science

The contributions of traditional peoples have been incorporated in modern applied sciences such as medicine, architecture, engineering, pharmacology, agronomy, animal husbandry, fish and wildlife management, nautical design,

plant breeding, and military and political science (Ford, 1979; Weatherford, 1988, 1991). Meso -American mathematicians and astronomers used base 20 to calculate calendars more accurately than those used by Europeans at the time of contact, even after the Gregorian correction (Kidwell, 1991; Leon-Portilla, 1980). In the Americas, traditional scientists developed the long-staple cotton that now clothes the world and also developed some 290 varieties of potatoes. Innumerable varieties of grain, oilseed, squash, hot peppers, as well as corn, squash, and beans were also developed. They introduced the use of rubber and platinum metallurgy (Weatherford, 1988, 1991), as well as large cotton sails and the hull design of the clipper ship and its modern America's Cup descendants (Duff, 1964). Native Americans developed highly articulated and effective approaches to grassland management (Roe, 1991) and salmon production (Stewart, 1977). Traditional native American healers discovered and used quinine, aspirin, ipecac (a drug still used in traumatic medicine to expell stomach contents), as well as some 500 other important drugs (Weatherford, 1988, 1991). In modern times these disciplined observers and innovative thinkers might well have earned several Nobel Prizes. Most people do not realize that they are benefiting from the labors of aboriginal scientists and doctors almost every time they dress, dine, travel, or visit their physicians.

The Wisdom Aspect of Traditional Science

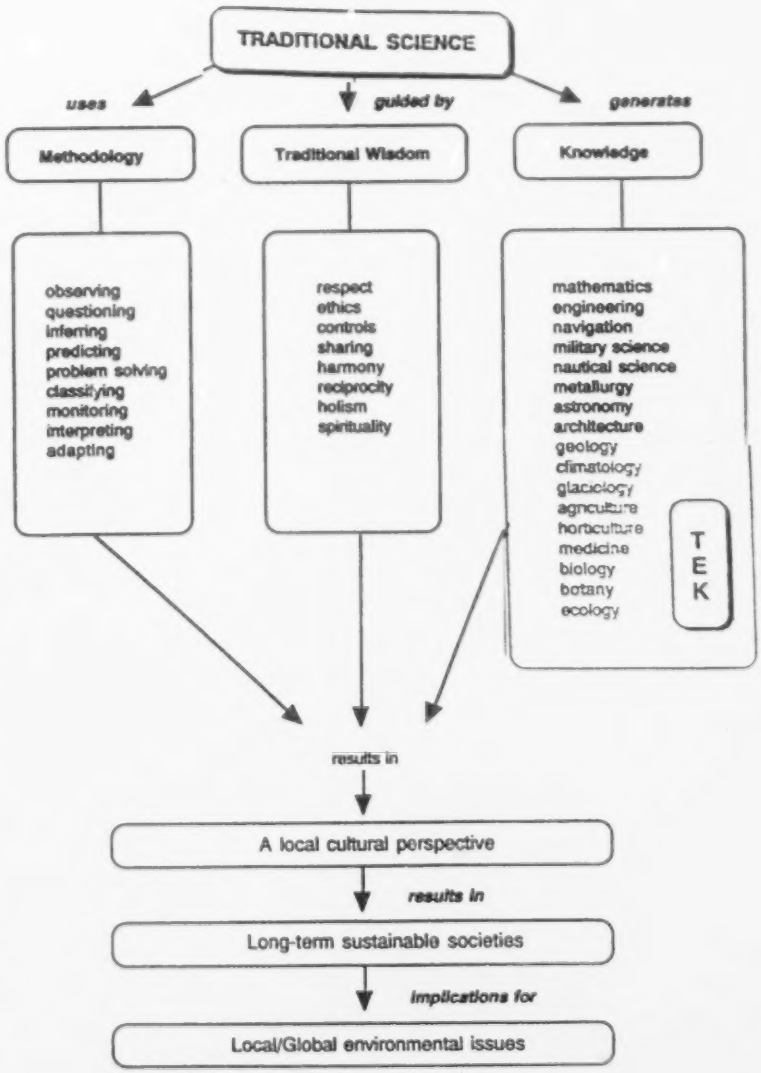
In addition to making significant scientific and technological discoveries, traditional cultures focus on applying useful discoveries to human needs. Generally, the wisdom aspect of traditional science is so much a part of traditional people's underlying conceptual systems that it is broadly diffused throughout the culture. Traditional wisdom, a virtually untapped treasury of concepts related to *respect* and *restraint*, provides community and individuals with well articulated "controls" designed to limit the application of powerful traditional science and technology in an inter-related world. Traditional wisdom usually begins with an understanding that spiritual essence infuses and defines all forms, and that all life-forms must be respected as conscious, intrinsically valuable, and inter-dependent. Respecting an animal means honoring its spirit and using every part of it's body. In practical terms, traditional wisdom extends the caring relationships associated with "family" life to communities and even to the environment. It teaches that it is wrong to exploit anyone or any other life forms—we are all relations. The deep interest our children feel in animals, plants, water, and earth should be trusted and encouraged. All creatures can be our teachers and while humans may readily affect other life forms, humans need not see themselves as particularly superior life forms. In fact, among the NisGa'a "Wolves and bears may be considered superior life

forms because they do not need to talk to communicate" (personal communication with NisGa'a elder Harold Wright).

Traditional Ecological Knowledge

Traditional ecological knowledge (TEK) represents experiences acquired over thousands of years of direct human contact with the environment. Although the term TEK came into widespread use in the 1980's, the practice of TEK is ancient (Berkes, 1993). Traditional ecological knowledge may be considered a subset of traditional science. One way of attempting to describe TEK within a traditional science framework, and of emphasizing its importance to contemporary environmental problems is illustrated in **Figure 1** below.

Pioneering work by ecologists like Conklin (1957) documented that traditional peoples such as Philippine horticulturists often possessed exceptionally detailed knowledge of local plants and animals and their natural history. In one case this included the ability to recognize 1600 plant species. Other kinds of indigenous environmental knowledge were acknowledged by scientific experts. For example, ecologist Pruitt has been using Inuit (Eskimo) terminology for types of snow for decades, "not in any attempt to be erudite, but to



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aid in the precision in our speech and thoughts" because when dealing with ice phenomena and types of snow "There are no precise English words" (Pruitt, 1978).

Increased appreciation for ethnoscience, ancient and contemporary, paved the way for the acceptability of the validity of traditional knowledge in a variety of fields. Various works showed that many indigenous groups in diverse geographical areas from the Arctic to the Amazon (for example, Posey, 1985) have had their own systems of managing resources. Thus, the feasibility of applying traditional ecological knowledge to contemporary resource management problems in various parts of the world was gradually recognized (Johannes, 1989; Johnson, 1992; Berkes, 1993; Inglis, 1993; Williams & Baines 1993).

Berkes (1993) provides an overview of TEK theory and scholarship in his comprehensive article, " Traditional Ecological Knowledge in Perspective." Besides discussing the significance of TEK and comparing it with western science he provides the following working definition:

> TEK is a cumulative body of knowledge and beliefs, handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment. Further, TEK is an attribute of societies; by and large, these are non-industrial or less technologically advanced societies, many of them indigenous or tribal. (Berkes, 1993, p. 3)

As can be seen, one problem of integration is related to the refusal of many scientists to recognize traditional ecological knowledge as science because of its spiritual base, which is regarded as superstitious and fatalistic. What some fail to recognize is that spiritual explanations often incorporate important ecology, conservation, and sustainable development strategies (Johnson, 1992). In reference to traditional ecological knowledge, Johnson and Ruttan (1991) point out that:

> Spiritual explanations often conceal functional ecological concerns and conservation strategies. Further, the spiritual aspect does not necessarily detract from the aboriginal harvester's ability to make appropriate decisions about the wise use of resources. It merely indicates that the system exists within an entirely different cultural experience and set of values, one that paints no more and no less valid a picture of reality than the one that provides its own (western) fame of reference. (cited in Johnson, 1992, p. 13)

Johnson (1992) further asserts that "the spiritual acquisition and explanation of TEK is a fundamental component and must be promoted if the knowledge system is to survive" (p. 13).

Towards a Multicultural View of Science Education

Science textbooks and teaching materials need to provide examples of the limitations of western science and traditional science and opportunities need to be provided for students to examine the part of the culture under consideration in terms of futuristic considerations. Omitting these types of activities results in a distorted, romanticized view of western science, and it leaves students without the necessary concepts and vocabulary for thinking about the complexities and contradictions that characterize the nature of science.

In addition to making science education more sensitive and appropriate to the needs of First Nations children, it is imperative that First Nations peoples' contributions to science be elucidated for mainstream students. The introduction of aboriginal examples can add interest and excitement to the science classroom. All students need to identify and debate the strengths and limitations of different approaches in order to explore how others experience the world, and to broaden their understanding of the nature of science. A critical approach to teaching science can be used to help confront and contribute to the elimination of racism, ignorance, stereotyping, prejudice and feelings of alienation. Students need to be encouraged to examine their own taken-for-granted assumptions and to distinguish between those that reflect perfectly natural and appropriate cultural preferences and those that are rooted in misinformation or in an unwillingness to allow for the existence of alternative perspectives.

Science education must help *all* students understand what science really is, what its powers are, what its limitations are, and more important what it can become. The focus should not be on getting children of ethnic minorities to *adopt* the scientifically accepted notion of a concept, but on helping children of all cultures to understand western science concepts, and to examine the differences and similarities between their own beliefs and western science concepts. The exploration of combining the two approaches can become an important part of scientific literacy—and success in school.

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Attempting to Foster the Development of Number Sense

Werner W. Liedtke

Fostering the development of number sense is an important goal of mathematics teaching. Special teaching strategies, classroom settings and assessment techniques are required to reach this goal.

The first part of this paper will attend to answers for the questions: *What is number sense? Why is number sense important?* and *How can teachers contribute to fostering the development of number sense?* The second part will include descriptions of attempts to collect and evaluate information in classrooms about activities, settings, and strategies that were designed and selected to specifically focus on the development of number sense. The last part will contain a few comments about assessing the presence of number sense and the importance of the role of the teacher.

What is number sense? Greeno (1991) states that "number sense is a term that requires theoretical analysis, rather than a definition" (p. 170). Such a theoretical analysis which includes the hypothesis that number sense is an example of conceptual reasoning is beyond the scope of this paper. However, the examples listed by the author can provide a hint about the phenomenon labeled number sense: flexible numerical computation (ibid. p. 171); numerical estimation; and quantitative judgment and inference (ibid. p. 172).

Hope (1989) concludes that "number sense is considered a desirable trait to foster, although its meaning, as other notions of thinking, ..., can be defined only broadly" (p. 12). The author goes on to explain that, "number sense cannot be defined precisely, but situations where it is evidently lacking can easily be recognized" (p. 12). Anyone who has had an opportunity to observe and/or interview students has to agree with this conclusion. However, the opposite is also true. Many times the presence of indicators of number sense is also easy to recognize.

According to the *Curriculum and Evaluation Standards for School Mathematics* (National Council of Teachers of Mathematics, 1989), number sense is an intuition about numbers drawn from all the varied meanings of number. It

has five components: developing number meaning; exploring number relationships with manipulatives; understanding the relative magnitude of numbers; developing intuitions about the relative effect of operating on numbers; and developing referents for measures of common objects and situations in their environment (pp. 39, 40).

Why is number sense important? Number sense appears at the top of every grade level in the *Mathematics K-7: Integrated Resource Package 1995* (Ministry of Education, 1995). This placement is not accidental. It is indicative of the fact that "number sense contributes directly to problem solving abilities and flexible thinking in numerical situations" (Van de Walle 1990, p. 63). Number sense is a requisite for becoming mathematical problem solvers. Number sense is a key component of mathematical literacy.

How can number sense be developed? Greeno (1991) suggests that "it may be more fruitful to view number sense as a by-product of other learning than as a goal of direct instruction" (p. 173). Howden (1989) expresses the view that number sense "develops gradually as a result of exploring numbers, visualizing them in a variety of contexts, and relating them in ways that are not limited by traditional algorithms" (p. 11). The author concludes that the development of number sense requires an environment that fosters curiosity and exploration at all grade levels. This environment should embrace "doing mathematics," or an active mathematical involvement that goes beyond the procedural suggestions included in many textbooks or on similar paper-and-pencil type tasks. The conceptual understanding and the thinking that are part of number sense can best be accommodated in a setting where appropriately selected tasks are part of conversational activity. "The capabilities that we associate with number sense go beyond knowing facts and procedures; they involve participation in activities" (Greeno 1991, p. 211).

Fostering the development of number sense requires a focus on selecting or preparing activities and creating appropriate settings. As Reys (1989) points out, students are likely to develop and display their number sense when they are in an environment that values it and causes it to "come to the surface of intellectual thought" (p. 71). This focus and environment should be part of the first grade (Markovits et al., 1989) or even earlier (Liedtke, 1997) and remain integral to ongoing mathematics teaching-learning.

Collecting information in classrooms: Attempts to gather information about activities, teaching strategies, assessment procedures, and classroom settings have included the delivery of units to students in grade one; the developing, delivering, and teaching of sequences of sample lessons for a given topic or idea; developing lessons for/with teachers, having these delivered and then sharing/assessing students' responses; delivering demonstration lessons; and

presently being a resource person for two, year-long, teacher directed projects.

Although the importance of developing number sense is indicated and advocated in the *Mathematics K to 7: Integrated Resources Package 1997* (Ministry of Education, 1995), information about types of activities, possible teaching strategies and favorable classroom environments conducive to this development is either non-existent or very sparse. This is especially true for the early grades.

One major goal for the projects that have been initiated in different classrooms can be explained by the statement," ...without a major commitment by a curriculum to experiences that develop number sense, many children will never understand number in any way other than counting" (Van de Walle 1990, p. 64). One purpose of these ongoing projects involves building a collection of curriculum experiences that can be shared with teaches and teachers-to-be. An important guideline for types of experiences and activities for the early grades is based on the idea delineated by Willoughby (1990) that, "... if we teach children to use their fingers intelligently in the early grades, they should be more able to get along without using them later" (p. 20). In terms of the projects, "intelligent use of fingers" included going beyond the minimization of counting (by ones); it was de-emphasized.

As suggested, one aim included the creation, selection and preparation of curriculum experiences that might contribute to having students acquire an intuition about numbers; develop number meanings; explore number relationships; and understand the relative magnitude of numbers that are part of number sense. The challenge was to create an environment to encourage flexible thinking in numerical situations. Following the description of a selected sample of curriculum experiences that were used with students, a few comments will be made about classroom settings.

Sample Tasks: Although Greeno (1991) suggests that the development of number sense should be viewed as a by-product of other learning , there exist tasks and activities that should be considered to be conducive to the visualization of number meanings and number relationships. The following were chosen to illustrate possible examples of these types of tasks.

After a number (e.g. xxxxx) and the names for this number (five, 5) are introduced, students are requested to use fingers and to show five in different ways (part-part-whole understanding). Estimation tasks involve decisions about whether a group of objects briefly displayed shows fewer than five, more than five or about five. A Five-Hunt requires students to look for and identify fives and to use matching to show that there are five.

After the numbers to ten are introduced, a group of fingers is briefly flashed. Students are asked to assign a number name to the arrangement that was displayed and then to use their fingers to show it in a different way. For another type of task, students are asked to provide two pieces of information, "How many did you see?" and "How many were not seen?" or "How many would be needed to show all ten fingers?"

To have students visualize two-digit numbers (24, 36, ...) and thus develop meanings for these numbers tasks are presented that involve representations with fingers. The following problems and questions illustrate this type of setting. For example, students are asked to think of "twenty-four." If fingers are used to show this number, what is the greatest possible number of students that would be required to show this number? What is the least number of students? What are some other possibilities? The goal is to have standard names for two-digit numbers thought of as being represented by persons e.g. for 42 - five persons, or four tens and two ones.

Initial explorations of the process of addition consist of simulating the action with groups of fingers and then describing different possible solution procedures, e.g. what are different ways of showing the answer for 4 plus 3 or 7 plus 9? (For 4 + 3, the 4 could be shown or thought of as 2 and 2; or the 3 as 1 and 2. The new arrangements are used to show a five, or a whole hand and two more—the familiar arrangement for seven.)

The framework of the *Mathematics K to 7 - Integrated Resource Package* (Ministry of Education, 1995) identifies the development of mathematical literacy as the major goal of mathematics teaching and learning. Developing positive attitudes, becoming mathematical problem solvers, communicating mathematically, connecting and applying mathematical ideas, and reasoning mathematically are major components of this literacy (ibid. pp. 2, 3). The accommodation of this goal and these components along with the aim to foster the development of number sense suggest that traditional rote-practice sheets with simple instructions like "Solve," are inadequate and inappropriate. Instructions are required that give students the opportunity to go beyond merely perceiving and acting on symbols and procedures with symbols by requiring students to reflect and express ideas about them.

For one project (Liedtke, 1997), students from grades one and three were asked to examine the same, or parts of the same basic addition facts practice sheet over an extended period of time. Types of tasks and problems included: sorting and re-sorting (e.g. easy; difficult; similar; different; related; liked; not liked); how to make difficult items easier; how to teach someone how to find the answers (more than one way); writing word problems for different settings outside the classroom and for different people; showing how to use a

known answer to find another answer and other possible answers; showing (explaining; drawing) how to find answers with blocks and diagrams; creating riddles (about answers; about equations); and designing a game for the items shown on the practice sheet. These types of instructions led to discussions that contributed to fostering the development of number sense. This was demonstrated by the observations that were made and by the responses included on many of the activity sheets completed by the students.

Classroom Settings: The development of number sense requires not only appropriate tasks and activities, but a favorable environment where students are provided with an opportunity to talk and do mathematics. This environment should provide occasions for: cooperative and/or collaborative work; discussions of mathematics; questioning; justification of thinking; and writing about mathematics (National Council of Teachers of Mathematics, 1989, p. 20). A simple teaching algorithm for number sense does not exist. Aside from the fact that the make-up of classrooms is becoming more complex and teaching styles differ, it is unlikely that many of the teachers who are teaching mathematics did experience the favorable environment that is required as part of their mathematics learning or their exposure to learning how to teach mathematics. The instructional practices that need to receive decreased attention: "rote practice; rote memorization of rules; one answer and one method; use of worksheets; written practice; teaching by telling" (ibid. p. 21) are likely to be a major part of an existing repertoire of teaching strategies for these teachers. The requests for extensive inservice by teachers that accompanied the introduction of the new Integrated Resource Packages seem well founded, indeed.

Number Sense Assessment: Since fostering the development of number sense is an important goal of mathematics teaching; parents deserve to be informed about their children's progress as far as this notion is concerned. Attempting to collect data about the presence of number sense requires more than the use of new or revised pencil and paper tests. Indicators of the presence of number sense can be collected while observing students working with a partner or in small groups. Responses to queries during brief interviews are a valuable source of assessment or diagnostic information (Liedtke 1996; Skelton 1995). Interpreting observations and verbal as well as non-verbal responses (i.e. usage of fingers while talking) related to the development of number sense requires a knowledgeable and skillful teacher. Developing these observations and interpretation skills as part of one's repertoire of assessment or diagnostic strategies also requires inservice.

Observations and classroom interactions that have been part of the projects that involved attempts to foster and assess the development of number sense reinforce the statement made some time ago that, "There is not now, never has been, and is hoped, never will be a genuine substitute for a good teacher

who knows how and what children need to learn and when they need to learn it!" (Reys 1971, p. 558). There is no substitute for a good teacher with a sense of efficacy (Smith III, 1996) who knows how to foster the development of mathematical literacy and number sense.

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Investigating the Evaluation of Student Achievement

John O. Anderson

The evaluation of student achievement is a significant component of classrooms and schools. A set of constructed portfolios containing achievement products and background information for a simulated student was used in this study to investigate how teachers formulate the evaluation of achievement of their students.

Introduction

The evaluation of student achievement is a significant component of classrooms and schools. Teachers in British Columbia, for example, have to report on student achievement to parents at least three times each year. The completion of tests, assignments, projects, journals and portfolios for evaluation purposes are typical student activities within the classroom. However, the ways in which teachers examine and translate student products such as essays and test responses into marks or grades is not well researched.

The study reported in this paper was part of a larger collaborative research project involving colleagues from both Queen's University and the University of Victoria that is designed to investigate how teachers formulate the evaluation of achievement of their students. The dataset for this study was developed by Wilson and Shulha of Queen's University (Wilson, 1996) who created a set of portfolios containing achievement products (such as written assignments and tests) and background information for a simulated student called *Chris* in a grade 8 language arts curriculum. The contents of the portfolios were controlled in terms of achievement level of products and the background of the student. This manipulation resulted in a number of different students called *Chris*.

As part of an undergraduate teacher education course in classroom assessment, 147 student teachers graded the components of a portfolio over a 12 week period and reported a final grade for the *Chris* assigned to them at the end of the term. These scores and grades generated by the student teachers were the basis for an investigation of the processes and structures developed by these student teachers as they evaluated student achievement.

The Data

The data consisted of the scores and grades generated by the 147 student teachers for the components of a student portfolio they were given. Over a 12 week period new components were periodically added. A total of eight different student achievement products were included in the portfolio. Information about the background of the student was also provided. Most of the products were presented in bundles of three and all three were included in the portfolio. One of them was identified as belonging to *Chris*. For example, the same three copies of the writing assignment called *A Trip to the Mall* were included in all of the portfolios, one at a high level of achievement, one at medium and one low level of achievement. One of the copies was identified as belonging to *Chris*, the other two were from other students. *Chris'* assignment was either of a high, medium or low level of achievement depending on how the given portfolio was structured. Two of the products (*Final Examination* and *School Dance*) were identical in all portfolios. The achievement products included in the portfolio were:

1. *A Trip to the Mall*: A written piece that had a maximum score of 25 (three levels).
2. *Salmon for Simon*: A multiple-choice item test of reading comprehension that had a maximum score of 9 (three levels).
3. *Did I Order an Elephant?*: A *Cloze*-format test of reading comprehension with a maximum score of 15 (three levels).
4. *New Kid on the Block*: A short-answer, open-ended format assignment on reading that had a maximum score of 18 (three levels).
5. *Ghost Ship of Mohone Bay*: A multiple-choice format test of reading with a maximum score of 9 (three levels).
6. *Mending Wall*: This was a writing and editing assignment completed on the computer to represent a student's *best work* with a maximum score of 25 (three levels).
7. *School Dance*: A written piece with a maximum score of 25 (single level).
8. *Final Examination*: This was a mixed format test (matching, identification, multiple-choice and short answer) with a maximum score of 130 (single level).

Background information on *Chris* was presented in the form of notes, memos and school reports, and included:

A. *Expectation*: Expectations were to be inferred from information on student scores on the *Canadian Tests of Basic Skills* and parental occupational status. There were three levels of expectation: *low, medium* and *high.*

B. *Growth*: Achievement reports from other school areas such as Mathematics, Science, History and Resource Centre reports suggested that *Chris* was either *falling behind*, performing *steadily* or *improving*.

C. *Parental Involvement*: Parental involvement was to be inferred from school memos and notes related to parental involvement with school activities such as parent interviews or volunteer work. There were two levels of involvement: low or high.
D. *Sex*: This could be inferred from an audio tape of *Chris* reading a passage of text for miscue analysis.

The Analysis

The descriptive statistics for the scores awarded the different assignments and tests, and the final grade on the report card are summarized in Table 1. Of particular interest is the range of scores given to the *Final Examination* and the assignment on the *School Dance*, both of which were identical products common to all 147 portfolios. *Final Examination* scores had a standard deviation of 6.7 with a range of scores of 79 to 122, and *School Dance* had a standard deviation of 2.1 with a range of 15 to 24. This suggests that even though the student teachers were all evaluating the same piece of work, there existed another element that caused different results to be generated.

The correlations between scores (Table 2) show generally positive, low to moderate linear relationships between scores. There appears to be no single achievement product dominating the final grade (*Report Card*) for *Chris*, although all but *A Salmon for Simon* show moderate, positive correlations with the final grade. However, the test Salmon *for Simon* has negative correlations with three other products (*A Trip to the Mall, Ghost Ship of Mohone Bay* and *Mending Wall*) and a near zero relationship to the final grade on the report card. There is nothing obvious in the data that suggests an explanation for this puzzling result.

Table 1 Summary Statistics for Portfolio Contents

Score Source	Mean	Standard Deviation	Range Maximum	Range Minimum
A Trip to the Mall	18.8	2.75	25	13
Salmon for Simon	6.0	2.19	10	1
Did I Order an Elephant?	12.4	1.43	15	8
New Kid on the Block	14.3	2.53	18	7
Ghost Ship of Mohone Bay	5.4	2.15	9	2
Mending Wall	19.7	3.34	25	6
School Dance	20.2	2.09	24	15
Final Examination	100.3	6.70	122	79
Report Card	77.2	4.78	90	65

Table 2 Correlations Between Scores

Score Source	1	2	3	4	5	6	7	8
1. A Trip to the Mall								
2. Salmon for Simon	-.33							
3. Did I Order an Elephant?	.09	.28						
4. New Kid on the Block	.16	.04	.11					
5. Ghost Ship Mohone Bay	.25	-.59	-.03	.03				
6. Mending Wall	.34	-.38	.14	.13	.57			
7. School Dance	.31	.02	.14	.20	-.15	.01		
8. Final Examination	.34	.03	.04	.19	-.03	.14	.28	
9. Report Card	.50	-.07	.26	.38	.37	.49	.36	.57

Table 3 Regression with Achievement Products

REPORT = CONSTANT + TRIPMALL + SALMON + ELEPHANT + DANCE + NEWKID + GHOST + MENDWALL + EXAM

N: 147 Multiple R: 0.787 $R^2 = 0.619$

Effect	Coefficient	Std Error	p (2 tail)
CONSTANT	25.77	4.01	0.000
TRIPMALL	0.55	0.11	0.000
SALMON	0.71	0.16	0.000
ELEPHANT	0.17	0.20	0.375
DANCE	0.58	0.13	0.000
NEWKID	0.42	0.10	0.000
GHOST	0.79	0.17	0.000
MENDWALL	0.36	0.10	0.000
EXAM	0.06	0.02	0.003

Analysis of Variance

Source	DF	Mean-Square	F-Ratio	p
Regression	8	254.9	28.0	0.000
Residual	138	9.1		

The *Report* was the final grade assigned *Chris* by the student teacher. The student teachers were not given explicit instructions as to how to derive the final grade. It was assumed that this grade would be based upon the contents of the portfolio, that is, the marks the student teachers assigned to each achievement product. However, it was also thought that the background information could influence the decisions of the student teachers in regard to *Chris'* final grade. To investigate the relationship between the final grade (*Report*) and achievement products and background information, regression analyses were conducted. One analysis used the achievement products as the predictors of *Report*, another analysis used background information as the predictor, and a final analysis used all data as predictors of *Report*.

The regression of achievement products on *Report* (Table 3) was significant and accounted for 62% of the variance in *Report*. All achievement products with the exception of *Did I Order an Elephant?* had significant regression weights.

The regression of background information on *Report* (Table 4) was significant, but accounted for only 11% of the variance in *Report*. Only *Expectations* and *Growth* had significant regression weights.

Table 4 Regression with Background Variables

REPORT = CONSTANT+EXPECT+GROWTH+INTEREST+SEX

N: 147 Multiple R: 0.336 $\mathbf{R^2 = 0.113}$

Effect	Coefficient	Std Error	p(2 tail)
CONSTANT	73.35	2.02	0.000
EXPECT	1.28	0.46	0.006
GROWTH	1.41	0.46	0.002
INTEREST	0.09	0.75	0.905
SEX	-0.36	0.75	0.634

Analysis of Variance

Source	DF	Mean-Square	F-Ratio	p
Regression	4	93.2	4.5	0.002
Residual	142	20.1		

The regression of both achievement products and the background information on Report (Table 5) accounted for 63% of the variance in *Report*. In this part of the analysis, none of the background variables had significant regression weights and the achievement product. *Did I Order and Elephant?* had a non-significant regression weight which was a similar situation when achievement products alone were regressed on *Report*.

Discussion

The results of the regression analyses suggest that the contents of the portfolio account for approximately 63% of the variance of a *Chris'* final grade (*Report*), leaving over a third of the variance unaccounted for. This finding raises the question: What were other sources that student teachers used to develop a final grade for *Chris* ? The numerical data do not provide an answer to this important question. Both Wilson (1996) and Shulha (1996) have also studied these data and their work suggests some possible answers to this question. As part of the study, all student teachers were asked if they thought their *Chris* was showing improvement over the 12 week period of the study. Wilson observed that all student teachers rated their Chris as improving, whereas the portfolios were structured such that only about one third of the Chris' showed improving performance in terms of the information that was included in the portfolio. About one third of the portfolios were structured to have declining performance, and about third had steady performance. This suggests that indeed the student teachers were observing something about their *Chris* that was not actually part of the portfolio. Perhaps it was simply due to the expectations that educators bring to the classroom that all children will improve as a result of schooling, and this expectation was realized in their perceptions of *Chris'* performance over the 12 week period of the study. Wilson also found some interaction between the sex of the student teacher and the sex of *Chris*. These findings suggest that the student teachers were bringing some expectations, preconceptions or some such other predetermined perceptions into the decision processes used to derive a final grade for *Chris*.

Shulha (1996) analyzed qualitative data that was generated through questionnaires and interviews with the student teachers during the 12 weeks of the study. Her findings indicate that student teachers did not simply aggregate scores on the achievement products to calculate a final grade. Most student teachers commented that grading is a complex task, and many noted that they did not have enough information in the portfolio to determine a final achievement status for Chris. Many noted that student *effort*, and some indication of change and improvement are essential elements in evaluating students. Without access to some knowledge of student effort, the student teachers felt unable to come up with a final grade. One student teacher comment that seems to capture the frustration some student teachers felt and that would be quite disconcerting for most educational measurement

Conclusion

These initial findings are not completely unexpected. Most educators and students are aware of the subjective, idiosyncratic components of evaluation and grading. Evaluation of student achievement within the classroom is not a science to the extent practiced within the context of large-scale assessments such as final examinations or selection testing. However, classroom evaluation is the most frequent and pervasive assessment students are exposed to over their years of formal education. Investigating the ways in which this assessment is conducted should and can serve to improve practice over the long term.

This study has provided some interesting and useful insight into how the process of student evaluation works and has developed a useful approach to the investigation. The development of structured portfolios can provide an excellent base upon which to study how teachers evaluate students in the classroom. This study is but one part of a larger collaborative project that will continue this investigation of the processes involved in the evaluation of student achievement.

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specialists is :

> *I hate to admit it but the mark really came from the grades earned on the assignments.*
> *This did not show development. This showed how Chris averaged out.*

Table 5 Regression with Achievement Products and Background Varables

REPORT = CONSTANT + EXPECT + GROWTH + INTEREST + SEX + TRIPMALL + SALMON + ELEPHANT + DANCE + NEWKID + GHOST + MENDWALL + EXAM

N: 147 Multiple R: 0.792 $\mathbf{R^2 = 0.628}$

Effect	Coefficient	Std Error	p(2 tail)
CONSTANT	27.77	4.42	0.000
EXPECT	0.32	0.33	0.339
GROWTH	-0.57	0.83	0.496
INTEREST	0.17	0.51	0.732
SEX	-0.67	0.51	0.191
TRIPMALL	0.56	0.11	0.000
SALMON	0.66	0.19	0.001
ELEPHANT	0.09	0.20	0.663
DANCE	0.53	0.15	0.000
NEWKID	0.42	0.11	0.000
GHOST	0.90	0.25	0.000
MENDWALL	0.40	0.10	0.000
EXAM	0.06	0.02	0.002

Analysis of Variance

Source	DF	Mean-Square	F-Ratio	p
Regression	14	172.3	18.8	0.000
Residual	134	9.2		

The Art Glass Movement and Curriculum Design for Higher Education

Laura Kaufman-Weisbord

The significance of the art glass movement as an important force in contemporary art is reviewed and the development of a program in art glass for higher education is explored.

Introduction

The purpose of this paper is to explore the significance of the *art glass movement* to contemporary art; its values and applications, particularly as it is being taught in higher education today. The intent is to provide information from experts in the field to art educators, artists and collectors who wish to learn about the form. This information should make it possible to produce a practical curriculum which does not yet exist. A program design for higher education addressing the teaching of glass appears to be both timely and much needed. Once constructed, this curriculum paradigm and suggestions for its evaluation will be made available for educators wishing to add glass to their art programs.

Rationale

Particularly indicative of changes in the field of higher art education today is the narrowing of gaps between the fine arts, applied arts, decorative arts, and architectural arts. Since glass is a material that is so much a part of our modern society, there appears to be a genuine need for trained visual artists to design and produce a quality of work that reflects an ideal level of aesthetics and professionalism.

It is notable that there has been an international revival of arts literacy and the teaching of visual arts in general by many universities. This significance is illustrated by a statement of the Working Group on the Arts in Higher Education that successfully expresses a philosophy concerning art education and its intrinsic value in addition to presenting a simple rationale supporting the research and the model that will be proposed:

> The art disciplines are basic: as means of communication, as historical components of civilization, and as providers of unique forms of knowl edge. As such they need no other forms of justification as essential components of education. While study in the arts disciplines may en hance other skills, encourage personal development, or lead to a stronger economic base for professional presentation of the arts these are not and should not be the primary reasons for their study. (Legislative and Policy Perspectives, 1992, p.29)

If the value of teaching and learning about art in higher education is accepted, then we should also consider the merits of instructing students to utilize glass as a medium by studying its existing position in contemporary curricula in institutions around the world.

Perhaps the most significant aspect of glass in art today is its unique relationship with various art forms, including architectural, applied and visual aesthetics. Ostensibly the longevity of glass is one of its many attractions and probably a reason that it finds itself alongside gold artifacts in most museums.

Another reason that glass has a tradition as a valuable material is its unique history. Originally glass trade beads produced on the island of Merino in Italy represented currency. Artisans who produced these beads did so under the threat of death if they revealed any craft secrets used to produce this glass money at an ancient mint. Today it is presumed that this severe punishment was largely responsible for a convention of dramatic secretiveness practiced by most artisans who produced glass.

Art historians have highlighted the importance of glass in various forms of architecture and in the decorative arts. Works of glass are still admired and viewed as major contributions to society centuries later. The importance of artglass is reflected in its prominence in reproductions, reviews, catalogues and various publications devoted to its coverage.

It might be suggested that the major influences affecting the credibility and importance of glass in contemporary art today are based on technology alone, but it is more likely that the history of art and glass itself, both in architecture and decorative arts, has been the stimulus for modern artists to pursue its application in their work today. Historically a possible evolutionary force in forming the art glass movement may have been the emergence of the French and English 19th century Impressionist painters, particularly their concerns with capturing light and it can be argued that this preoccupation with light and art would naturally affect 20th century architectural art, recognized as an ideal framework for the medium of glass.

It is acknowledged that only in the last twenty years has the a*rt glass movement* emerged as an important force in contemporary art. This trend may be attributed to today's technological explosion which allows artists to assemble works that in the past were only possible to manufacture in large professional studios and then only by employing trained technicians while renting costly machinery. It is the opinion of this author that these technological advances as well as the prevalent use of art glass in contemporary architecture today are important reasons for introducing and preparing students to produce works of quality in this medium.

Many professional glass artists who attended the 1991 Montreal International Environmental Glass Conference give credit to the innovative glass art in the newly constructed metro stations in Montreal, Quebec during the 1967 Exposition as an important and worldwide influence for artists and architects. Both the Berri De Montigny Metro Station, designed and executed by Pierre Lapalme and Pierre Osterath and the highly colourful and innovative assembled work of Marcelle Ferron at Place d'Armes continue to impress commuters with the beauty and power of glass.

In addition, an extremely influential component in support of public art in Quebec has been a program entitled *One Percent For The Arts* that allocated one percent of the total building budget to art in any government funded building. Recently major works in glass art have been incorporated into architecture, giving more visibility to the art form, greater credibility to the medium, and added possibilities of income to artists. Thanks to technological advances in the art glass field it is possible that today the artist or designer can, by availing themselves of modern techniques and skills, produce works of glass limited only by their imagination.

The growing importance of art glass is also reflected in the extensive recent accumulation of literature and other resources pertaining to the subject. A preliminary survey by the author of the history of the movement and of the extent of available resource materials includes recently published texts, slide collections, video tapes, journals, and conference reviews. The significance of art glass as a modern art form is further emphasized by its appearance in collections of world renowned museums such as the Metropolitan Museum in New York City. This museum has incorporated art glass, particularly works by Louis Tiffany and Frank Lloyd Wright into its permanent collection. The institution's commitment has served to change the perspective of many who have never considered glass as having serious potential for art and has encouraged those who are responsible for its display to include contemporary glass artists' work into mainstream art galleries, catalogues and architecture.

The world renowned Corning Museum of Glass in New York State extended

their core museum in 1981 in order to house their collectionof contemporary artists in glass. The innovative beauty of the Corning Museum and the fact that it includes the Steuben Glass Studios served to further encourage collectors and artists to appreciate the legitimacy of this medium. Objects of Steuben Glass have traditionally been presented to dignitaries by the United States Government. An example of such a gift was presented to Prince Charles of England and his bride Princess Diana on the occasion of their wedding. Another respected institution is the Glassmuseum in Ebeltoft, Denmark. The museum has stated in their correspondence with the author-artist that her work has been viewed by more than 50 000 visitors, indicating both the popularity of glass and its social significance today.

Although reports in publications indicate that art glass is being taught in a number of countries, a clearly established curriculum design does not seem to exist. Therefore, the professional artists who are presently teaching this subject are working independently with little support from their peers. This lack of a coordinated consistent approach became quite apparent during preliminary surveys conducted by the author at the Second International Congress of Art Glass Educators in August 1991 at the Corning Glass Museum in New York State.

The first and founding meeting of art glass educators occurred in 1990 in Barcelona, Spain. At the second Corning Museum meeting in May, 1990 the existing popularity and prevalence of art glass courses in a number of universities and colleges around the world was obvious and was reflected by the large number of participants who were professional glass artists as well as educators. This conference in New York was chaired by Klaus Mojoe who strongly articulated his interest in sharing knowledge with the other members of the group. The main purpose of a closed meeting was to exchange knowledge and relate information to the group as to how the subject was being approached and taught by other professionals in his field. During this meeting, the author was fortunate in being granted many enlightening interviews with a number of highly respected art educators from the United States, England, Germany, Canada and Australia. These interviews revealed many similarities and differences regarding what is being taught in art glass by different individuals in higher education today.

In August, 1991, at McGill University, the author was able to videotape presentations of Glass Masters at the Second International Environmental Art Conference. Information from these videotapes will undoubtedly add to new ideas that should be very useful in providing further insight into an energetic and new field. 130

Objectives and Methodology

The objective of the projected procedure will be twofold. The first concern will be to continue to collect information and analyze the methods by which art glass is presently being taught in the context of higher education around the world. The plan is to use an interview protocol and then transcribe and collate audiovisual material from the recent and aforementioned conference.

The purpose of this type of project is not to employ a statistical analysis of data, but rather to investigate the views of a number of individuals who are experts in the field. Anderson, who in 1990 developed an interview protocol entitled Elite Interview, was instrumental as an advisor for the development of the procedures that were used to collect information regarding art glass education for this project. The second goal of this project deals with applying the collected data towards the creation of a curriculum design that may be used by artists and educators in the field. In sum, the proposed task involves a comprehensive collection and evaluation of current thinking about how art glass is presently being taught in higher education institutions around the world. This information and issues related to curriculum design, should make it possible to develop a relevant curriculum; one that addresses contemporary values, needs and interests, and is based on modern teaching philosophies and methods.

It is the intention to limit specialist interviews to those who are teaching or have taught art glass in higher education and who are practicing artists. However, the project will also utilize input from professionals who have taught in conjunction with an existing education program in other areas of the visual arts.

A methodology that makes it possible to form systematic strategies for planning a curriculum may be arrived at in a number of different ways. In his comprehensive text, Barnes (1982) suggests beginning a plan with a problem to be solved, or listing a set of skills to be learned. He recommends that if one begins by listing the skills that are to be learned, consequently a number of projects could be introduced that would allow the introduction of these skills at an appropriate level. He suggests that within this context one should determine whether these skills are useful within their own right, or that the instructor might allow the need for them to become evident during the students' attempts to resolve a problem. This approach is one that Mager in Barnes (1982) bases upon a contemporary theory of planning by objectives. A more appropriate and contemporary system that is used in North America for planning visual art literacy is Discipline Based Art Education (D.B.A.E.), which is well funded and established by The Getty Foundation in the United States and supported by the over 30 000 members of the National Art Education

Association. However, there exist lively debates among senior members of the group about the value of D.B.A.E. A simplification of the D.B.A.E. framework breaks down the system into four major parts or learning strands:

- Art Making
- Aesthetics
- Art History
- Art Criticism

In basic terms, this system promotes a structured and accountable approach to art education. It accommodates the professional experience of the author as an art instructor and is confirmed in interviews regarding the methods and curriculum use in higher education with other glass artists from various countries.

Barnes (1982) mentions that ideally, a sliding scale of evaluating and analyzing curriculum should be employed in order to allow each student to aim a little higher than he/she has been able to reach. The necessity for restrictions in class size to attain this goal are also mentioned. An important aspect of this project will be the design of an appropriate and effective evaluation instrument for the curriculum. In this connection both the Ville de Montreal at CDEC (Conseil des Evenements Culturels) (1990-1992) and the Metiers d'Arts de Quebec (1991-1992) were consulted with regard to designing evaluation charts for the licensing of artisans and artists. These consultations will be valuable in preparing an evaluation for the teaching of art glass in higher education.

At lease two practical issues merit immediate attention. In examining program limitations, problems of constraints due to significant expenses that which might be incurred while working in glass ought to be addressed. Due to budgetary concerns it is worth mentioning that possibilities abound for incorporating recyclable materials and reasonably priced kilns, grinders and other basic equipment into a glass course. Costs, although always a consideration in any program, need not be a prohibitive limitation. The equipment costs would be comparable to that of a basic printmaking or ceramic studio. Naturally, extra equipment can lead to becoming acquainted with more sophisticated techniques. If possible these could be added to the program over a period of time.

Instructing glass art at various levels and to diverse age groups over the past twelve years has led the author to conclude that the crafting of this material requires skills, safety awareness and motor control. Many of the abilities involved are not acquired until late adolescence. Therefore, an art glass program would best be suited to students of eighteen years or older.

Conclusion

A quote about a valuable rationale for teaching a potential glass art program can serve to conclude this paper. This statement's source is from Artist/Designer/Painter and Sculptor, Eisch, who with his family in Frauenau, Germany has been involved in glass making for over 270 years. A number of his and his wife Gretl's inspiring works are featured as part of the permanent collection at the Corning Museum. His 1990 presentation at the Corning Museum Conference entitled "Is there Life in Your Art, Your Relationship, Your Education System?" highlighted his personal motto, *Glass as a medium for the artist!* Certainly a well designed curriculum would support this philosophy and it is likely that many of those who attended this conference would agree by saying that Eisch spoke for all when he said:

> *We have to oppose to a technologically perfectionized world with our imperfection. We have to try to bend the straightlined expansive road of technological progress and make it round. We have to put up our pictures and signs on the street to warn people who are plunging for-ward blindly, that this is not the road to happiness. To make this world more humane and a little more pleasant, we need hands, many hands and poetic sensitivity.*

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The Acquisition of Strength - Catalyst for Research

David Docherty and Catherine A. Gaul

In the last three years a number of undergraduate and graduate students in the School of Physical Education have demonstrated an interest in the development of the different expressions of muscle strength. Issues related to the development of muscular strength and the work being conducted by faculty and graduate students to address these unresolved questions are discussed.

Introduction

Muscular strength, in its many manifestations, is generally considered a prerequisite for maximum performance in sport and for general health and wellness. Training protocols are often designed to increase muscle size (hypertrophy) which enhances the expression of absolute strength. However, an increase in muscle size is usually accompanied by an increase in body mass which in certain situations may not be acceptable. R*elative strength* training programs are designed to increase strength without changing muscle mass. This is achieved by improving the *neural drive* to the muscles that are involved in specific movement patterns. Despite the claims of the proponents of the different training regimens, there is a lack of scientific support and understanding in regard to the specific stimulus for muscle hypertrophy. Consequently, many students in Physical Education have developed an interest in research related to the acquisition of strength and particularly in the identification of training regimens that optimally develop the different expressions of strength. This interest has been nurtured by courses, practical experiences with a variety of populations, and exposure to research being conducted by faculty and a few graduate students. As a result of this interest there have been many honours projects conducted and graduate theses produced that focus on aspects of muscular strength development. In addition, there have been a number of collaborative research efforts among faculty and students.

Having a group of students and faculty with a similar interest in a specific area of research has produced a number of benefits for both faculty and students. These include collaborative research pursuits, grant submissions, attainment of research funds, publications, and the development of a coopera-

tive relationship with local medical facilities and specialists. The purpose of this paper is to show how the interest in the topic of developing strength has stimulated a number of research questions that have become the catalyst for honors projects and graduate theses.

Factors Influencing Muscular Strength

Hypertrophy: Muscular strength can be enhanced by an increase in muscle size (hypertrophy) and an increase in neural drive (Kraemer, Deschenes & Fleck, 1988; McDonagh & Davies, 1984; Moritani & DeVries, 1979; Narici, Roi, Landoni, Minetti & Cerretelli, 1989). Muscle hypertrophy occurs through an increase in the cross-sectional area (CSA) of each muscle fibre as a result of protein synthesis (Goldspink, 1992; MacDougall, 1992). A few authors have proposed that an increase in CSA can be the result of an increase in the number of muscle fibres (hyperplasia) in a specific muscle. However, to date such findings have been limited to animal models (Gonyea, Sale, Gonyea & Mikesky, 1986). Force (strength) is proportional to the CSA of muscle so an increase in size (CSA) will produce greater force generation (Gonyea & Sale, 1982; Narici et al., 1989). An increase in muscle CSA is normally accompanied by an overall increase in body mass or size.

Neural influences: An increase in muscular strength can occur without a concomitant increase in muscle CSA and has been attributed to increased neural drive (Hakkinen, Komi, & Kauhen, 1987; Moritani & DeVries, 1979; Narici et al., 1989). Neural drive can be enhanced in many ways including greater recruitment of motor units or motor unit activation (MUA), quicker firing frequency of motor units, improved synchronization of MUA, better recruitment of synergistic muscles, and improved muscle coactivation (Narici et al., 1989). Findings from work in other laboratories, also suggest that weight training can lead to a decrease in muscle inhibition, allowing the muscle to generate greater force prior to the reflexive triggering of the golgi tendon organ (Narici et al., 1989; Tesch, 1984). Neural adaptations are considered to be the first changes to the neuromuscular system following resistance training (Sale, 1992).

Body size and performance: In certain sports it is advantageous to increase strength and body mass (e.g. football, rugby, ice hockey). However, for activities where body weight must be maneuvered or manipulated (e.g. ice skating, synchronized swimming, gymnastics, soccer, swimming) a strength-related increased mass may be undesirable . Therefore, in these sports it would be advantageous to increase muscular strength without an increase in body mass. For some sports there exists an optimal body mass that must be maintained. In these cases it may remain advantageous to increase strength with-

out any increase in body mass (e.g. rowing, track and field, and rugby).

Muscular Strength Research

INDEPENDENT VARIABLES: The central research question for muscular strength projects conducted in the School of Physical Education has revolved around the effects of different resistance training programs on neuromuscular adaptations related to the development of muscular strength and power. Despite anecdotal and empirical claims, there exists little scientific evidence in regard to *optimal* programs to develop strength, especially with regard to the development of muscle hypertrophy and neural drive.

There exist a number of independent variables that can be manipulated in the design of training programs and, by extension, used to construct research questions. These variables are listed and described in Table 1.

Table 1 Independent Variables in Muscular Strength Research

Variable	Modifiers
Load and Intensity	• repetitions to failure
Action type	• isometric, concentric, eccentric
Tempo of actions	• fast, slow, super slow
Position	• of limb, of body
Number of exercises	• per set • per muscle group
Frequency of training	• length of session • number of sessions
Order of exercises	• large muscles vs. small muscles • single vs. multijoint
Rest	• between sets • between sessions
Periodization	• within training cycle • accumulation and intensification • loading vs. unloading
Training age	• type of experiences
Sex	• male, female

DEPENDENT VARIABLES: Several ways to assess changes in muscular strength can be employed. Changes in strength can be assessed by dynomometers, using various contraction velocities and allowing for concentric and/or eccentric contractions to be evaluated. The relationship between force production and velocity of action can be evaluated using a force platform. Maximum load tests (1RM), a percentage of 1RM test (3RM or 10RM), and standard load tests can be employed to measure unilateral or bilateral strength. Changes in strength have also been related to changes in performance measures such as running speed, vertical jump, horizontally hopping, acceleration, swimming time, distances thrown (e.g. shot).

In the laboratory muscle hypertrophy and adaptation have been monitored by biopsy, magnetic resonance imaging (MRI), ultrasound, and anthropometric measurements (muscle girth corrected for adipose tissue). Muscle substrates, such as creatine kinase, lactate, phosphates, and ATP, have also been used to monitor muscle fatigue and muscle degradation.

Neural adaptation has been inferred from specific tension, measured by dividing the force (kg) generated by a muscle group by the CSA (cm^2), and electromyography. Some laboratories have used an interpolated twitch response to access the percent motor unit activation during isometric muscle actions (Belanger & McComas, 1989).

In recent years a number of honors and graduate students have conducted descriptive, intervention (training), and clinical studies that have dealt with the area of strength. The different types of projects are described in Table 2.

Collaborative Research

The involvement of a number of students focusing on a specific research area has produced many advantages.
These include:

- the research questions or issues are considered from a number of perspectives,
- the possibility of offering seminars/tutorials in an area of mutual interest,
- the possibility for students to share and discuss their knowledge in a specific area,
- the generation of a definite synergy (energy) by a critical mass of students with a specific focus,
- the development of relationships with Victoria General Hospital Ra-

diologists that provides the opportunity to employ Magnetic Resonance Imaging technology as a means of evaluating muscle cross sectional area
- the benefits students derive from each other's experiences and expertise, and
- the existence of an opportunity for joint projects and mutual study of subjects.

Table 2 Honour and Graduate Theses Involving Strength Research

Student	Degree	Research
Brandenburg, J.	M.Sc. (Kines.)	The effects of an eccentric (supermaximal) loading protocol upon muscle adaptation.
Campbell, S.	B.Sc. (Honors)	Comparison of the bilateral deficit in trained and untrained females.
Chestnut, J.	M.Sc. (Kines.)	The effects of 4RM and 10RM weight training protocols on strength strength, CSA, and specific tension in untrained males.
Cronin, J.	M.A.	Developing strength, power and speed in the adolescent male.
Gillies, E.	M.Sc. (Kines.)	The effects of concentric time under tension on strength and hypertrophy in resistance trained trained women.
Harrison, D.	B.Sc. (Honors)	A model describing the muscle damage elicited by different training programs as a stimulus for muscle hypertrophy.
Monteleone, B.	M.Sc. (Kines.)	Reliability and inter-relationships among measurements of speed, strength and muscular power.
Sleivert, G.	Ph.D. (Kines.)	Neural and muscular factors influence power generation.

Conclusions

The area of strength and power development has captured the interest of a number of students and provided a catalyst for honors projects and graduate theses. There have been many benefits in having several students and faculty with a common research interest including the opportunity for sharing of knowledge, experiences, and resources. Three students have successfully collaborated with Victoria General Hospital Radiology department to use the Magnetic Resonance Imaging system to measure the cross-sectional area of muscle. This has also helped faculty access the equipment and establish collaboration with the radiologists and technicians for future research and projects. The interaction between students is enhanced as they share perspectives and articles related to their specific research interests. As a result, the quality of the projects and theses has been very high and led to a number of collaborative publications with faculty. The research model that has evolved is one that has been shown to have considerable benefit for students as well as faculty.

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Between Suicide and Murder—Living in the Space?

Antoinette Oberg, Denyse Parizeau, and Sue Taylor

Jacques Daignault (1992) postulates that thinking that is dynamic and vital occurs in the space between murder and suicide. To know is to murder in the sense that it puts further thinking to death and leaves potentialities stillborn. On the other hand, to give up the hunt to know is to abandon hope, or to commit a form of suicide.We are trying to understand what it is to live in the space between murder and suicide, between the desire to know and the despair of knowing. Instead of searching for answers, we are trying to multiply the questions, problematize the known, proliferate the possibilities.

The three speakers, Antoinette - A, Denyse - D, and Sue - S, stand centre stage. A recording is played of the first verse and the chorus of the song, "Both Sides Now." The title of the session is projected on a screen.

> Bows and flows of angel hair
> and ice cream castles in the air
> and feather canyons everywhere
> I've looked at clouds that way.
> But now they only block the sun
> They rain and snow on everyone
> So many things I would have done
> But clouds got in my way.
>
> I've looked at clouds from both sides now
> from up and down, and still somehow
> it's clouds' illusions I recall
> I really don't know clouds at all. (Mitchell, 1967)

All: To know or not to know: that is the question!

A: [*aside*] With apologies to Hamlet - and Shakespeare.

D: Is that the question?

A: Not exactly.

D: To be dead or alive! Is that the question?

S: Suicide or murder - in both cases you're dead.

D: The space between! What is the space between? That is the question!

All: Yes!

S: What are we talking about?

D: That is the question.

A: Precisely.

All sit, positioned with A sitting in the middle.

D: The desire to know the truth is a desire to stop searching, to put an end to uncertainty. Thinking that we know something for sure, as a "fact," stops us dead in our tracks. The search is over, the data are in conclusions are drawn, and the sentence is given.

A recording is played of the following adaptation of the song, "The Great Pretender" (*Ram*, 1955).

Oh, yes - I'm the great knower
Thinking I can know anything
My understanding is such - I can't know too much
So I murder as I hunt to know.

Oh, yes - I'm the great knower
Pretending I know everything
I give up and I die - its all been a lie
There is no way to know everything.

Too real is this knowing - it's all make believe
I gave up in the knowing - nothing else to conceive.

Oh, yes - I'm the great knower
Believing I can know everything
It's just a matter of time - and I will find
The answers to all questions posed
And in the knowing my mind will close.

A: Let me tell you a story. There was a woman in my Alexander movement class who complained that her feet were too weak to support her. She said her legs ached and she could not stand up for more than 10 minutes at a time. She said she had been given exercises, but they were too painful to do. The teacher looked at her thoughtfully and then asked her who had told her her feet were so weak and had given her painful exercises. "The physiotherapist," she replied.

"Let's think of this situation differently," began the teacher. "We could say that your feet are perfectly capable of supporting you and that the way in which you have been balancing on them is not using them to their maximum strength. So let's think of a way that you can balance through your feet so that they can use their intrinsic strength. If your muscles have become weak, it is because you have been using them in ways for which they were not intended. Let's figure out how you can use your feet in a strong and integrated way."

Within five minutes, the woman had learned a way to stand on her feet and to exercise them painlessly. Her body relaxed. Tears welled up in her eyes. She realized she could support herself.

S: The knowledge of the expert became a form of violence in this woman's life. It reduced her to a single identity: the one with the weak feet, nothing to stand on, no foundation, no support for who she was, what she knew herself, what she could do, who she could become. The exercises given by this expert were derived from her assessment of structural inadequacy. Although they were intended to remedy the deficiency, they could not because the woman, in her weakness, did not have the strength to do them. They left her immobile.

The introduction of another possible identity by the teacher did not change the condition of the woman's feet, but enabled her to use her feet to support herself. The teacher did not erase the woman's weakness, but allowed her to create a different identity as a person who could move from weakness to strength.

D: OK. I see how knowing for sure, as objective truth, can stop us dead in our tracks. Is this what the word "murder" in the title refers to?

A: Yes. Pinar et al. (1995) say, "Knowledge—understood poststructurally as the reduction of difference to identity, the many to the one, heterogeneity to homogeneity—is violence" (p. 481). Serres (1980) says to know is to kill.

D: Oh yeah?

The speakers change positions so that S is sitting in the middle.

S: I have a story. When I first began nursing in the recovery room I was asked to develop an inservice on treating chest pain because my previous nursing experience was in cardiology. I was thrilled to be asked. I had always wanted to teach and had not previously had an opportunity to teach other nurses. I prepared thoroughly for the task. I read all of the most recent literature on angina and other forms of chest pain. I reviewed the standing orders used by the cardiologists and I consulted with my former colleagues. And I created an hour long inservice—a lecture on the diagnosis and treatment of chest pain - according to the standard model of professional development inservices. Eventually the day came to present the inservice. When I was finished my colleagues thanked me and complemented me on a job well done. I was pleased that the learners seemed to understand the material.

Some weeks after this inservice a patient was admitted to the recovery room following a carotid endarterectomy, a procedure to remove deposits in the artery in the neck that supplies blood to the brain. Shortly after admission, the patient began to complain of neck discomfort. Although on the surface that would appear to be unexceptional, most patients having this surgery experience little or no pain. Nevertheless, the nurse was unconcerned and treated his pain with a mild narcotic. At approximately the same time, the nurse noted the presence of a heart irregularity on the patient's monitor. A physician was consulted and it was decided that treatment was not required. The patient remained in the recovery room for several hours. During this time he continued to complain of pain and nausea and the heart irregularity continued.

At 3:00 p.m. I arrived to begin my shift and I was asked to take over from the nurse caring for this man. As soon as I looked at him I was concerned. As I heard the report on his condition, my alarm increased. I knew that he had experienced a myocardial infarction, a heart attack. How did I know? I wish I could explain, but I can't. It was just that my experience as a cardiology nurse had taught me "the look" of a patient who has experienced a heart attack. I could try to delineate some of the signs and symptoms that I used to make my determination but it still wouldn't really explain my reaction. The whole is more than the sum of the parts. As soon as I came to the realization that the patient was in a very serious condition his physician was contacted and treatment was begun. Unfortunately it was too late, the damage was too severe and the patient died later that night.

For me the crux of the story is that he died because when I taught my colleagues about chest pain I couldn't give them my experience and my intuitive

understanding of cardiology. I could tell them about the signs and symptoms and treatment protocols but I couldn't give them my ability to differentiate between neck pain which is cardiac in origin and neck pain which is surgical in origin. In addition, because the nurses were predisposed to look for surgical origins, in effect they had a surgical paradigm, it did not occur to them to examine other possibilities.

Projected on the screen is the following verse by Lao Tzu from the Tao Te Ching.

> When they think they know the answers, people are difficult to guide.
> When they know that they don't know, people can find their own way.

D: Because the nurses thought they knew the reason for patient's pain, they did not think to search out other possibilities. Had they not been so certain, they might have treated the patient differently, paid more attention, looked for other alternatives.

A: It sounds as though we're advocating uncertainty here, or at least claiming that certainty is suspect. If we take this claim seriously, the temptation is to give up.

S: Suicide. Right?

A: You got it! Giving up the desire for certain knowledge can lead to nihilism, an attitude which says "anything goes" or "things are what they are."

D: What happened in the hospital story wasn't very ethical, but that sounds even less ethical.

A: This nihilistic attitude may be fostered in the helping professions, especially in education, when we become preoccupied with outcomes. The emphasis on productivity may make efficiency our number one criterion. Technology is enlisted to a greater and greater degree to achieve this goal. Frequently we may forget to ask questions about what forms of knowledge are excluded by this agenda or what qualities of human relations are promoted by it. In effect, this approach may create more of what we already have. It leaves us on the same track, only going faster. The technological wizardry may be so alluring that we forget we are essentially leaving the basics as they are. We may give up on the possibility of changing our direction fundamentally.

S: I'm getting depressed.

D: Let's focus on how we get to the space between murder and suicide.

All: That's the question!

The speakers change position so that D is sitting in the middle.

D: Here is my story. During my undergraduate studies I was required to write a paper describing the theoretical framework for counselling that would be most congruent with my own philosophy. It was easy for me to choose a theory because the humanistic-existential perspectives were very close to my ways of relating with others. In addition to a description of the theory, I was required to identify any aspects of the theory that I thought might present difficulties for me in helping clients. Although I felt that I understood the theory, the one tenet that created dissonance within me was the belief that although clients should be fully supported in exploring their feelings and issues, ultimately each client has the right and capacity to make choices, up to and including the decision to commit suicide. I knew that in all honesty, I would have great difficulty in allowing a client to leave a counselling setting if I genuinely thought it was likely that he/she would follow through on committing suicide.

When the paper was returned and I reviewed the feedback, it appeared that the professor had concerns about my understanding of the theory—specifically that I might not have comprehended the tenet related to clients' capacities to make decisions for themselves, especially as it related to the possibility of suicide. I decided to speak to the professor, not in order to change the mark, but to clarify my understanding of this tenet of the humanistic theory, and to delineate why I experienced the dissonance.

During the discussion I explained the humanistic-existential theory that the paper was based upon. I also told the professor about a personal experience that had significantly influenced my thinking. When I was nineteen years old I was a pre-school teacher and I was at the beach with a colleague and eight children. While we were playing I noticed an elderly gentleman dressed in a suit with a hat and cane walking purposefully towards the ocean shore. As I watched, he walked into the water. When I noticed that he was continuing to walk into the ocean, I pointed him out to my colleague and asked her to take the children and telephone for help. I then hurried over to the gentleman. I asked him if he was all right. He told me not to worry about him, to carry on with what I was doing. He continued walking into the ocean. I asked him to stop, at least briefly, and to talk with me. He refused and continued to walk. I took his arm and pleaded with him to stop and think about this. At that point, he told me that it was his right to do this—his wife had died and he had nothing left to live for. I said, "I'm sorry, I just can't let you do this."

I could hear that what he was saying was rational. On the other hand I felt desperate and I was hoping that help would arrive soon. Despite his understandable despondency, I did not feel I could allow him to kill himself. I stayed with him and continued in my attempts to persuade him to stop. Finally, the police arrived and abruptly whisked him out of the water and told him that he was not allowed to do this. (It was the 1970's, when suicide was a criminal offense.)

As I told this story I realized that my professor understood my struggle. It was no longer merely a matter of theory. It was instead a deeply difficult dilemma. As I think about the situation now, I realize that there was no "proper" solution to this problem. The police followed "the law"—but in so doing they essentially committed murder because they denied this man's agency in his own life. They closed down the only possibility he had left. To follow the humanistic perspective would equally be murder, because in that perspective, ultimately the client's choice must be respected; there is no other option. However, to simply give up and allow him to commit suicide would have been nihilistic.

A: This situation calls for a different kind of thinking, one that will allow us to think the difference between murder and suicide and thus disrupt the dualism and transform it into something else. It requires thinking that is not representational, not a mental activity as scientists and logicians might conceive it, not the transcription of thoughts into words. But it does use the mind, thoughts and words. The idea is not to stop thinking, but to think differently: instead of searching for answers, multiply the questions, problematize the known, proliferate the possibilities. In this way it is possible to stay in the space between the invariable and the variable, to be defined by neither one exclusively but by both. In practical terms, it is to subvert the dualism between theory and practice and yet to honour the differences between them. And we are not talking here about an average or a centrism or a moderation.

S: Well, what are we talking about?

D: Deleuze (cited in Daignault, 1987, p.27) says it's a matter of absolute speed. He says this thinking in the middle will be a lightning flash, a performance that will be "staged."

S: At least we have something going for us! But really, what does this mean?

A: We're trying to make room for another way - perhaps many other ways - of knowing. The knowing that happens in the passage between suicide, which is accepting things as they are, and murder, which is trying to find *the* answer to our questions.

S: This sounds more like a place of not knowing!

D: Yes, but the not knowing is not the sort that can be remedied with more information. It is a condition in which there is no right answer and yet doing nothing makes as much of a difference as doing something.

S: Or perhaps we're talking about the kind of knowing that happens in the moment of knowing something just happened and not knowing what it meant; of knowing something must be done and not knowing what it is.

D: What could this mean for teaching?

A: It means teaching about a topic without tying it down, perhaps without even mentioning it.

S: Oh really!

D: It's like the story Pinar tells that Hwu tells that Daignault tells that Frank O'Hara tells in his poem.

S: This is sounding elusive already!

The speakers change position so that A is sitting in the middle.

A: "In the poem, the poet visits his friend, a painter. The poet notices that in the painting on which his friend is working are sardines. 'You have sardines in it,' he says. 'Yes, there is indeed something there.' The poet leaves, but returns days later to find the sardines gone from the painting. He leaves again, goes home and, thinking about the color orange, composes. O'Hara writes: 'One day I am thinking of a color: orange. I write a line about orange. Pretty soon it is a whole page of words, no lines. Then another page. There should be so much more, no, of orange, of words, of how terrible orange is and life.... Days go by. It is even in prose. I am a real poet. My poem is finished and I haven't mentioned orange yet. It's twelve poems. I call it "Oranges." And one day in a gallery I see Mike's painting, called "Sardines." (Pinar et al., 1995, p. 483).

S and D face each other to read the following poem, "Knots," by R. D. Laing (1970) while it is simultaneously projected on the screen.

S: There is something I don't know
that I am supposed to know.
D: I don't know what it is I don't know
and yet am supposed to know

S: and I feel I look stupid
if I seem both not to know it
and not to know what it is I don't know.
D: Therefore, I pretend I know it.
This is nerve-wracking
since I don't know what I must pretend to know.
S: Therefore, I pretend to know everything.
D: I feel that you know what I am supposed to know
but you can't tell me what it is
because you don't know that I don't know it.
S: You may know what I don't know
but not that I don't know it.
And I can't tell you
ALL: So you will have to tell me everything.

All stand and face the audience.
All: Don't expect us to know what we are talking about here. We are trying to think!

The following quotation appears on the screen.

> "Do not expect me to know what I am talking about here. I am trying to think." (Daignault, 1992, cited in Hwu, 1993, p. 4).

The speakers look at the screen, then at each other quizzically, then leave.

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